

Marine Accident Report

Fire On Board the Small Passenger Vessel *Port Imperial Manhattan*, Hudson River New York City, New York November 17, 2000



**National
Transportation
Safety Board**
Washington, D.C.

**THE CORRECTIONS BELOW ARE *INCLUDED*
IN THIS VERSION OF THE PUBLISHED REPORT**

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NTSB/MAR-02/02 (PB2002-916402)

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Small Passenger Vessel
Port Imperial Manhattan, Hudson River,
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November 17, 2000**

- The title page has been corrected to indicate 7472 as the proper report notation number (16 Nov 2002)
- Pages 43 and 44 have been amended to include the recommendation numbers (16 Nov 2002)

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Small Passenger Vessel
Port Imperial Manhattan, Hudson River
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November 17, 2000**

**NTSB/MAR-02/02
PB2002-916402
Notation 7472
Adopted June 11, 2002**



**National Transportation Safety Board
490 L'Enfant Plaza, S.W.
Washington, D.C. 20594**

National Transportation Safety Board. 2002. *Fire On Board the Small Passenger Vessel Port Imperial Manhattan, Hudson River, New York City, New York, November 17, 2000. Marine Accident Report NTSB/MAR-02/02. Washington, DC.*

Abstract: This report discusses the November 17, 2000, fire that occurred on the small passenger vessel *Port Imperial Manhattan* while it was underway in the Hudson River from Manhattan to Weehawken, New Jersey. None of 11 people on board the vessel was killed or sustained serious injury; however, a crewman and two passengers were transported to a shoreside hospital for medical evaluation. Damages related to the accident exceeded \$1.2 million.

From its investigation of this accident, the National Transportation Safety Board identified safety issues in the following areas: vessel maintenance, fire detection and suppression systems, crew response to the emergency, lifejacket stowage, safety information provided to passengers, and vessel communications.

Based on its findings, the Safety Board made recommendations to the U.S. Coast Guard, the Federal Communications Commission, NY Waterway, and the Passenger Vessel Association.

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Acronyms and Abbreviations

AWG	American wire gauge
CFR	<i>Code of Federal Regulations</i>
COI	Certificate of Inspection
FCC	Federal Communications Commission
FDNY	New York City Fire Department
IMO	International Maritime Organization
NFPA	National Fire Protection Association
NVIC	Navigation and Vessel Inspection Circular
PVA	Passenger Vessel Association
OCMI	Officer in Charge, Marine Inspection
RBA	rigid buoyant apparatus
SIU	Seafarers International Union
STCW	Standards of Training, Certification, and Watchkeeping for Seafarers

Executive Summary

On the evening of November 17, 2000, the U.S. small passenger vessel *Port Imperial Manhattan*, with three crewmembers and eight passengers on board, was en route to Weehawken, New Jersey, from the borough of Manhattan in New York City, New York, when a fire broke out in the engine room. Crewmembers attempted to extinguish the fire with portable extinguishers, with no success. The fire burned out of control, causing the vessel to lose power and forcing the crew and passengers to abandon the interior spaces. The crew and passengers were rescued by another NY Waterway passenger vessel, and the burning vessel was towed to Manhattan, where the New York City Fire Department extinguished the fire. One passenger was treated for smoke inhalation. No deaths resulted from this accident. The estimated cost to repair the vessel was \$1.2 million.

The National Transportation Safety Board determines that the probable cause of the fire aboard the *Port Imperial Manhattan* was NY Waterway's inadequate inspection and maintenance of the vessel's electrical system. Contributing to the extent of the damage were the lack of a fixed fire detection and suppression system and the crewmembers' lack of knowledge of proper marine firefighting techniques.

Based on its investigation, the Safety Board identified safety issues in the following areas:

- Vessel maintenance;
- Fire detection and suppression systems;
- Crew response to the emergency;
- Lifejacket stowage;
- Safety information provided to passengers; and
- Vessel communications.

As a result of its investigation of this accident, the Safety Board makes recommendations to the U.S. Coast Guard, the Federal Communications Commission, NY Waterway, and the Passenger Vessel Association.

Factual Information

Accident Narrative

About 1420¹ on November 17, 2000, a night shift crew comprising a master and two deckhands,² relieved the day shift crew of the small passenger vessel *Port Imperial Manhattan* (figure 1), which was owned by NY Waterway, a company that operates a daily commuter service between the borough of Manhattan in New York City, New York, and Weehawken, New Jersey. The day shift master stated that he experienced no problems with the vessel during his shift.³

During their evening shift, the three crewmembers alternated making hourly visual inspections of the engine space to check the temperature of the engines and to determine the condition of the space. Deckhand No. 2 said that he performed the last inspection of the engine space about 1 hour before the *Port Imperial Manhattan's* departure from the 38th Street Ferry Terminal, which was at 1855. In addition to the crew, eight passengers were on board the ferry.



Figure 1. The *Port Imperial Manhattan*, a commuter service vessel, was certificated by the U.S. Coast Guard (Coast Guard) pursuant to 46 *Code of Federal Regulations* (CFR) Subchapter T “Small Passenger Vessels (Under 100 Gross Tons).” Additional information about its construction appears later in this report, under “Vessel Information.”

¹ All times in this report are eastern standard time and based on a 24-hour clock.

² This report refers to the senior deckhand as deckhand No. 1 and the second deckhand as deckhand No. 2.

³ The *Port Imperial Manhattan* operated daily from 0700 to 2300. Each crew worked an 8-hour shift.

After leaving the dock, the master decided to have dinner and turned over the conn to deckhand No. 1. The master remained in the pilothouse to eat and was facing aft when he observed smoke coming from the port ventilator to the engine space. (See figure 2a.) About the same time, deckhand No. 1 told the master that the throttle felt as if it was not responding. The master sent the deckhand to the engine space to investigate and radioed another NY Waterway ferry to stand by until the cause of the smoke could be identified. Immediately following this radio transmission, the *Port Imperial Manhattan* lost propulsive power and steering control, and the vessel's VHF radio lost power.

The deckhands proceeded to the engineroom entry door located aft in the main passenger cabin. (See figure 2b.) The deckhands stated that they opened the aluminum door without first using their hands to feel for heat inside the space.⁴ Both deckhands stated that they received an electrical shock while holding the door open and were unable to enter the space because heavy smoke filled the engine compartment. They observed flames between the rungs of the ladder leading down into the engineroom. The deckhands said that they did not immediately inform the master about the fire. Rather, they decided to try and extinguish the fire. They propped open the access door with two lifejackets. Deckhand No. 1 said that he retrieved a CO₂ fire extinguisher that was stowed on the stern and discharged its contents into the engineroom compartment.

Deckhand No. 2 said that when he recognized the severity of the fire, he went to the pilothouse and told the master about the engineroom fire and that the deckhands had tried to control it, with no success. Deckhand No. 2 then offered to shut off the fuel supply valve in the main passenger cabin. The master agreed that the fuel supply should be shut off and dispatched the deckhand to do so. After shutting the fuel valve, deckhand No. 2 returned to the engineroom door to assist deckhand No. 1.

Meanwhile, after he had completely discharged the CO₂ extinguisher into the engineroom, deckhand No. 1 ordered the passengers to evacuate the main cabin, which was becoming increasingly filled with smoke, and to proceed to the foredeck. He did not distribute lifejackets to the passengers. During postaccident interviews, passengers stated that they did not consider the fire to be life threatening at the time.

Deckhand No. 1 then went to the pilothouse to inform the master of the situation while deckhand No. 2 went to the main cabin to get another fire extinguisher. In the pilothouse, the master instructed deckhand No. 1 to use a cellular telephone to call the company's managers to notify them of the fire on board the vessel. The shoreside managers, in turn, called 911 to report the fire. The company's operations manager also diverted the company vessel *George Washington* to assist at the scene.

Meanwhile, the 911 operator had transferred the emergency call to the FDNY, which dispatched a fireboat to the location.

⁴ According to standard firefighting protocols, firefighters should not enter a suspected fire area that is hidden behind a bulkhead or compartment door without first feeling the bulkhead or door with their hands to check for heat that would indicate the presence of a fire. See, for example, International Fire Service Training Association, *Marine Fire Fighting* (Stillwater, Oklahoma: Fire Protection Publications, Oklahoma State University, 2000) p. 242.

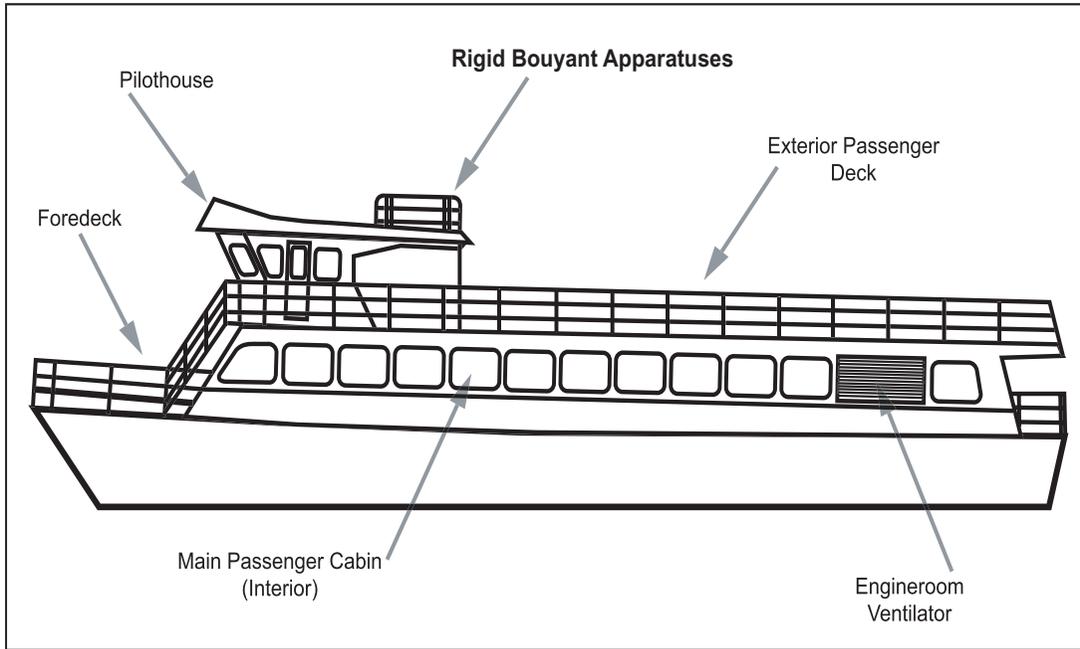


Figure 2a. The master was looking aft from the pilothouse when he saw smoke issuing from the engineroom ventilator on the port side of the vessel.

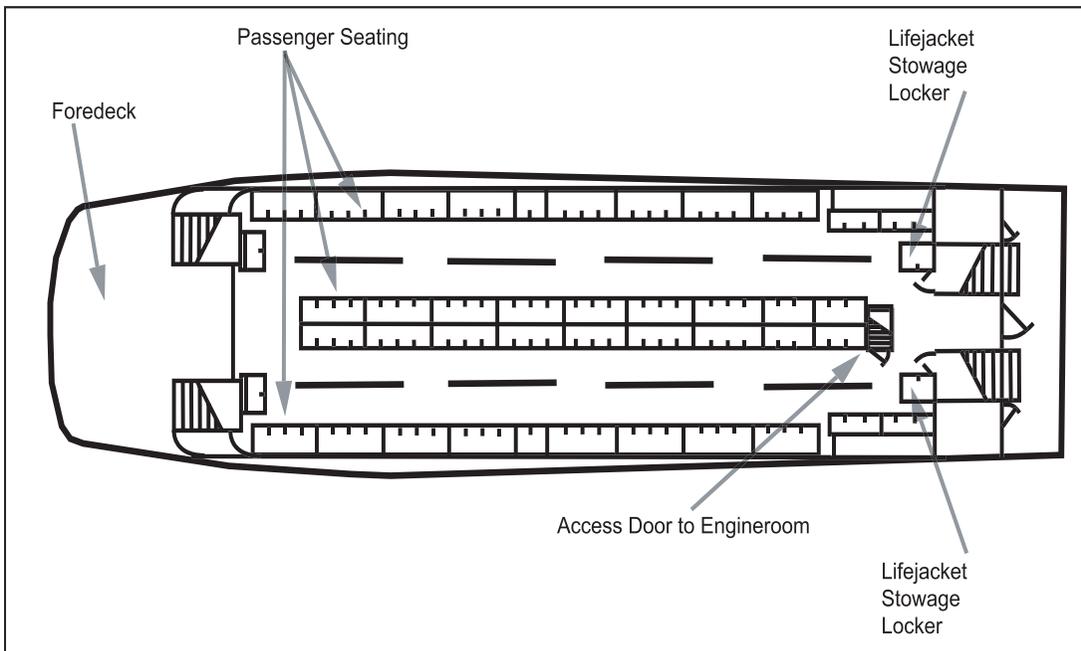


Figure 2b. At the master's direction, the deckhands went to check the engineroom, which was accessed through a door in the after area of the main passenger cabin.

The master then went to the main cabin and saw that it was filled with heavy smoke. He returned to the pilothouse and sounded the vessel's horn repeatedly to signal other vessels in the area that the *Port Imperial Manhattan* was in distress. He returned aft to the engineroom entry door, where he saw deckhand No. 2 discharging a fire extinguisher into the space. The master grabbed several lifejackets from the stowage locker and took them to the passengers on the foredeck. Deckhand No. 2 then lashed open the stern door to let the smoke out of the main cabin. The master then returned to the engineroom door and told the deckhand to go to the bow. The stern door and the engineroom door were left open.

While the crew was trying to put out the fire, the passengers had gathered on the open foredeck. They discussed the severity of the fire and what actions they should take, including whether they needed lifejackets. Some passengers used their cellular telephones to call 911. One passenger later testified that he thought that the passengers and crew might have to abandon the vessel and jump into the Hudson River. He, therefore, returned to the main cabin to retrieve lifejackets because he did not want to be in the river without one. When he returned to the foredeck, he handed out lifejackets to the other passengers, who later testified that they had also had fears about having to abandon ship. Shortly thereafter, the lights in the main cabin went out.

When the master and deckhand No. 2 reached the foredeck, the latter observed that some passengers had donned lifejackets. He noticed that two passengers were having difficulty donning their lifejackets. One passenger had been given a child-size lifejacket, so deckhand No. 2 gave the passenger his work vest. Deckhand No. 2 said that, by this time, the fire had spread to the main cabin and crewmembers could not return to the main cabin to retrieve additional lifejackets.

The master told the deckhands to prepare to launch the rigid buoyant apparatuses (RBAs),⁵ which were stowed on top of the pilothouse. A passenger helped the deckhands lower two of the seven RBAs down to the foredeck, and the deckhands prepared the abandon ship ladder so that it would be ready for use if needed.

About this time, an explosion occurred, and the main passenger cabin became engulfed in flames. According to witnesses, a passenger had to be restrained from jumping into the river. About this time, the FDNY fireboat arrived to offload passengers from the *Port Imperial Manhattan*. When the fireboat master observed that the deck of the fireboat was significantly higher than the deck of the *Port Imperial Manhattan* and realized that the passengers could not easily board, he backed his vessel away. The NY Waterway ferry *George Washington*, which was similar in size to the *Port Imperial Manhattan*, then approached the vessel and maneuvered so that it was bow to bow with the *Port Imperial Manhattan*. The passengers and crewmembers from the *Port Imperial Manhattan* were then able to step directly onto the *George Washington*. The flames then engulfed the foredeck where they had been standing.

⁵ An RBA is a flotation device with a peripheral line that survivors in the water can hold onto. A photograph of an RBA appears later in this report, under "Firefighting and Lifesaving Equipment."

According to the master, the fire spread throughout the entire vessel within 15 minutes of his noticing the smoke issuing from the port ventilator. The passengers later told Safety Board investigators that the fire engulfed the foredeck of the *Port Imperial Manhattan* within 30 seconds of their stepping onto the *George Washington*. The fireboat pushed the *Port Imperial Manhattan* alongside pier 42, where FDNY assets extinguished the fire. After Coast Guard inspectors verified the structural integrity of the *Port Imperial Manhattan*, a NY Waterway ferry towed it to the Weehawken terminal, where it was safely moored.

The *George Washington* took the *Port Imperial Manhattan*'s passengers and crewmembers to the Port Imperial terminal in New Jersey, where emergency responders and two ambulances were waiting. Six passengers declined medical treatment. The *Port Imperial Manhattan*'s three crewmembers and two of the passengers were taken to Palisades General Hospital in Weehawken, New Jersey, where one crewmember and two passengers were examined for injuries and released. The hospital then obtained samples from the three crewmembers for toxicological testing.

Table 1 summarizes the timeline of events in this accident.

Table 1. Timeline in the *Port Imperial Manhattan* accident.

Time	Event
0700–1420	Day shift crew conducts commuter runs every 15 minutes during rush hour and tours thereafter. The <i>Port Imperial Manhattan</i> operates normally during day shift.
1420	Night shift crew (master and two deckhands) relieves day shift crew.
1455–1755 (approximate)	Crewmembers alternate making hourly visual inspections of the engine space.
1855	The <i>Port Imperial Manhattan</i> departs the 38 th Street Ferry Terminal with 8 passengers.
+/- 3 min.	Master observes smoke issuing from port ventilator to the engineroom.
1900	Crew notifies NY Waterway's shoreside office of fire.
1906	Passenger calls 911.
1907	FDNY dispatches rescue boat <i>Marine 1</i> to the scene.
1914	Passengers are safely evacuated to the <i>George Washington</i> .
+/- 30 seconds	The <i>Port Imperial Manhattan</i> is engulfed by flames.
1945	<i>Marine 1</i> pushes the <i>Port Imperial Manhattan</i> to pier 42, where FDNY firefighters extinguish the fire.

Injuries

Safety Board reports of marine accidents use the injury criteria contained in 49 CFR 830.2. None of the people on board the *Port Imperial Manhattan* sustained an injury meeting the criteria for fatal or serious injuries. At Palisades General Hospital, one deckhand was treated for muscle pain and released. Hospital personnel evaluated the two passengers, treated one person for smoke inhalation, and then released both.

Damages

The vessel suffered fire damage in the engineroom and in the main cabin. The estimated repair cost was \$1.2 million. Additional information about the damage appears in the “Wreckage” section of this report.

Personnel Information

Regulatory Requirements

Small passenger vessels⁶ carrying more than 6 passengers for hire may not be operated without a valid Coast Guard Certificate of Inspection (COI), which is issued by the Coast Guard Officer in Charge, Marine Inspection (OCMI) for the zone. The COI stipulates a number of operating requirements, including minimum staffing needs. When determining the number and competencies of the crewmembers, the OCMI considers, among other things, the size of the vessel, its route, the type and horsepower of the vessel’s propulsion machinery, the number of passengers the vessel will carry, the type and location of lifesaving equipment installed on the vessel, and the hazards peculiar to the route and service.

According to its COI, the *Port Imperial Manhattan* was required to carry the following crew complement based upon the number of passengers as indicated in table 2.

Table 2. Required Crew Complement for the *Port Imperial Manhattan*

Number of Passengers	Required Crew*
1–149	One master, two deckhands
150–299	One master, one licensed mate, one deckhand
300–350	One master, one licensed mate, two deckhands
*The licensed mate can be substituted with a senior deckhand, designated in writing by the master and qualified in accordance with policy contained in Coast Guard Navigation and Vessel Inspection Circular (NVIC) 1-91, “Recommended Qualifications for Small Passenger Vessel Deckhands.”	

⁶ For the purpose of this report, small passenger vessels refer to vessels under 100 gross tons regardless of whether they operate under 46 CFR Subchapter T or 46 CFR Subchapter K.

Master

The master, age 30, had been in the marine industry since 1994. In June 1999, he had received a Coast Guard license as “Master Near Coastal Steam Or Motor Vessels Of Not More Than 100 Gross Tons.” He had worked for NY Waterway since January 2000, first as a deckhand and then, beginning in May 2000, as master on various vessels and routes. From June 30, 2000, until the night of the accident, he had served as master on the *Port Imperial Manhattan*.

The master stated that on the two evenings before the accident, he had gone to bed between 11 and 12 p.m. and had obtained about 8 hours of sleep each night. He said that, on the day of the accident, he had arisen at 9 a.m. and was well rested.

Deckhand No. 1

Deckhand No. 1, age 20, had worked for NY Waterway about 19 months, since graduating from high school. He did not hold and was not required to hold any Coast Guard documents. (See discussion under “Training.”) He had worked various shifts on company boats and had worked on the *Port Imperial Manhattan* on previous occasions. He had switched to the night shift on the *Port Imperial Manhattan* during the week of the accident.

Deckhand No. 2

Deckhand No. 2, age 27, had worked for NY Waterway about 18 months. He did not hold and was not required to hold, any Coast Guard documents. All of his marine experience had been on NY Waterway vessels. He had served on the *Port Imperial Manhattan* for 1 week before the accident.

The routine duties performed by a deckhand on a small passenger vessel include general housekeeping, basic vessel maintenance, handling mooring lines, collecting tickets, and directing passengers on and off the vessel. When permitted by the OCMI, deckhands can also serve as concessionaires or waitpersons.

Training

Regulatory Requirements. To be certified as a master of a small passenger vessel, individuals must serve for at least 1 year on the type of vessel for which they are seeking licensure and must take a license examination. The topics for license examinations are available from the Coast Guard and are published in trade books. To pass a licensing test, individuals must demonstrate that they are conversant in a number of topics, including, but not limited to, piloting, shiphandling, watchkeeping, first aid, fire prevention and firefighting appliances, and emergency procedures. After passing the test, masters are not required to take recurrent training or to be tested on knowledge of the subject matter except as participants in drills conducted by the Coast Guard as part of its annual inspections. For information about Coast Guard inspections, see “Vessel Certification and Inspection.”

The CFR does not require deckhands on small passenger vessels to hold Coast Guard licenses or documents or to possess formal qualifications for their positions. Regarding emergency duties such as firefighting, abandoning ship, and rescuing people in the water, CFR 185.420 stipulates the following, in part:

The owner, charterer, master or managing operator shall instruct each crewmember, upon first being employed and prior to getting underway for the first time on a particular vessel and at least once every 3 months, as to the duties that the crewmember is expected to perform in an emergency including, but not limited to, the emergency instructions listed on the emergency instruction placard required by 185.510⁷ of this part....

In addition, the person in charge of the vessel is required to conduct emergency drills, as stipulated by 46 CFR 185.520, which states:

The master shall conduct sufficient drills and give sufficient instructions to make sure that all crewmembers are familiar with their duties during emergencies that necessitate abandoning ship or the recovery of persons who have fallen overboard.

Title 46 CFR 185.520(f) and 46 CFR 185.524(d) require that abandon ship/man overboard drills and fire drills be logged or otherwise documented for review by the Coast Guard upon request. The records must include the date of the drill and a general description of the drill scenario and training topics discussed.

NVIC No. 1-91. In February 1991, citing new ship designs that permitted “significantly increased passenger capacity” on small passenger vessels, the Coast Guard issued NVIC No. 1-91 recommending qualifications and training for deckhands on such vessels. (See appendix B.) The NVIC states, in part,

The Coast Guard and the industry recognize that a Small Passenger Vessel’s licensed officer(s) would be unable to navigate the vessel and effectively respond to emergencies such as fire, engineering casualties, collision, flooding, medical emergencies, man overboard, etc., without the assistance of trained and qualified deckhands.

The NVIC further states, “The employment and training of qualified deckhands is the responsibility of the marine employer (46 CFR 15.103)” and “The Coast Guard is responsible for determining that Small Passenger Vessels are manned with competent crews.”

The stated intention of the NVIC is to provide guidance for marine employers and masters of small passenger vessels to use when structuring training programs for deckhands. The circular is further intended as guidance for Coast Guard OCMI’s during inspections for certification and reinspections, when evaluating training programs, and during drills conducted to ensure crew competency.

⁷ 46 CFR 185.510 requires that posted emergency instructions contain the actions to be taken in the event of fire, heavy weather, or man-overboard conditions.

Regarding firefighting, the NVIC recommends that every deckhand “should be familiar with” the following matters:

- Fire detection and alarm systems;
- Classes of fires and the appropriate firefighting technique;
- Location and operation of firefighting equipment;
- Location and operation of power, ventilation, and fuel shut-offs;
- Location and operation of watertight doors, hatches, fire-screen doors, and escapes;
- Procedures for mustering passengers; and
- Station bill assignment and duties.

Company Training. The master and the deckhands on the *Port Imperial Manhattan* were not required to complete formal firefighting training and, according to company officials, had not completed such training before the fire. Until shortly before the Port Imperial Manhattan fire, NY Waterway had provided basic familiarization instruction to its new employees by means of on-the-job training. During this training, new masters spent time in the wheelhouse under the tutelage of more senior masters until they became comfortable with the vessel operation. New deckhands, in turn, received instruction on their routine duties from the master. The deckhands received instructions from the master on emergency procedures and equipment during man-overboard drills and fire drills that were conducted monthly on the passenger vessels. NY Waterway records do not indicate that the *Port Imperial Manhattan* crew had ever practiced a fire drill in the engine room.

According to the senior director of marine operations for NY Waterway, shortly before the fire on the *Port Imperial Manhattan*, the company entered into a contract with the Seafarers International Union (SIU) to hire new deckhands. Under the agreement with the SIU, the union developed a training program at its Piney Point, Maryland, training center for newly hired deckhands. The training, conducted over a 5-day period, covers such topics as first aid, CPR, general deck fundamentals, marlinspike seamanship, and diesel fundamentals. One day of the training is devoted to on-board safety and 1 day to firefighting. Once the trainees complete the Piney Point course, they return to the NY Waterway facility in New Jersey, where they undergo another 5-day program on the company’s ferry operations. The trainees learn how to maintain the vessels, how and when to make on-board safety checks, how to tie up the vessels, and other routine operational duties. Thus, the new training program provides deckhands with 2 weeks of formal training before they are assigned to work on a vessel.

At the time of the fire, the company had sent the first contingent of new deckhands to the 2-week training program. However, the deckhands on the *Port Imperial Manhattan* had not yet had an opportunity to complete the new training.

Vessel Information

Background

Gulf Craft, Inc., based in Patterson, Louisiana, built the *Port Imperial Manhattan*, an aluminum passenger vessel, for NY Waterway in 1987. The vessel was certificated pursuant to the 1986 edition of 46 CFR Subchapter T, which states the following at CFR 175.05-1(b):

Any vessel carrying more than 150 passengers shall comply with the provisions of this subchapter and shall be subject to certain additional requirements as determined by the Officer in Charge, Marine Inspection.

The zone OCMI for the *Port Imperial Manhattan* when it began operations permitted the vessel to carry up to 350 passengers and to operate on lakes, bays, and sounds not more than 1 mile from shore.

At the time of the *Port Imperial Manhattan*'s construction, the Coast Guard was in the process of revising the CFR because the agency had safety concerns about the increased number of vessel designs that were tailored to take advantage of admeasurement exemptions.⁸ In some designs, small passenger vessels measuring less than 100 gross tons could accommodate more than 1,000 passengers. In 1996, the Coast Guard published 46 CFR Subchapters T and K, which stipulate additional construction and safety equipment requirements for all "new" small passenger vessels, that is, those built after March 10, 1996.⁹ Those vessels built on or before March 10, 1996, including the *Port Imperial Manhattan*, were grandfathered in both of the new subchapters and, thus, not required to install the additional safety features.

Basic Construction

The main characteristics of the *Port Imperial Manhattan* were as follows:

Length: 87.2 feet

Breadth: 24.4 feet

Depth: 8.0 feet

Gross Tons: 94.0

Net Tons: 64.0

Propulsion: Two 750-horsepower Caterpillar diesel engines.

⁸ A history of the small passenger vessel regulations appears in appendix C.

⁹ Subchapter T applies to small passenger vessels that carry 150 or fewer passengers; Subchapter K applies to small passenger vessels that carry more than 150 passengers.

The *Port Imperial Manhattan* had one main continuous deck with an enclosed main cabin that could accommodate 156 seated and 88 standing passengers. The upper deck had an enclosed pilothouse on the forward end of the vessel and an open space that could accommodate 161 seated and 72 standing passengers. The pilothouse was equipped with a magnetic compass, radar, depth gauge, and two VHF radiotelephones.

Engineroom

The amount of fire damage on the *Port Imperial Manhattan* precluded Safety Board investigators from reconstructing the preaccident condition of the engineroom and electrical system. Investigators, therefore, examined a similarly designed NY Waterway vessel, the *Port Imperial New Jersey*, whose electrical system had been modified in the same way as the *Port Imperial Manhattan*'s system.

The access ladder to the engineroom, located near the aft end of the main passenger cabin, stepped down in an athwartships, or side-to-side, direction. (See figure 3.) A hydraulic oil tank that provided fluid for the steering system was next to the hull, on the port side of the ladder. The port and starboard engines were near the forward engineroom bulkhead, and the generator was next to the forward bulkhead. Air was supplied to the engineroom through two vents located on the open upper deck. Each vent had a hinged damper.

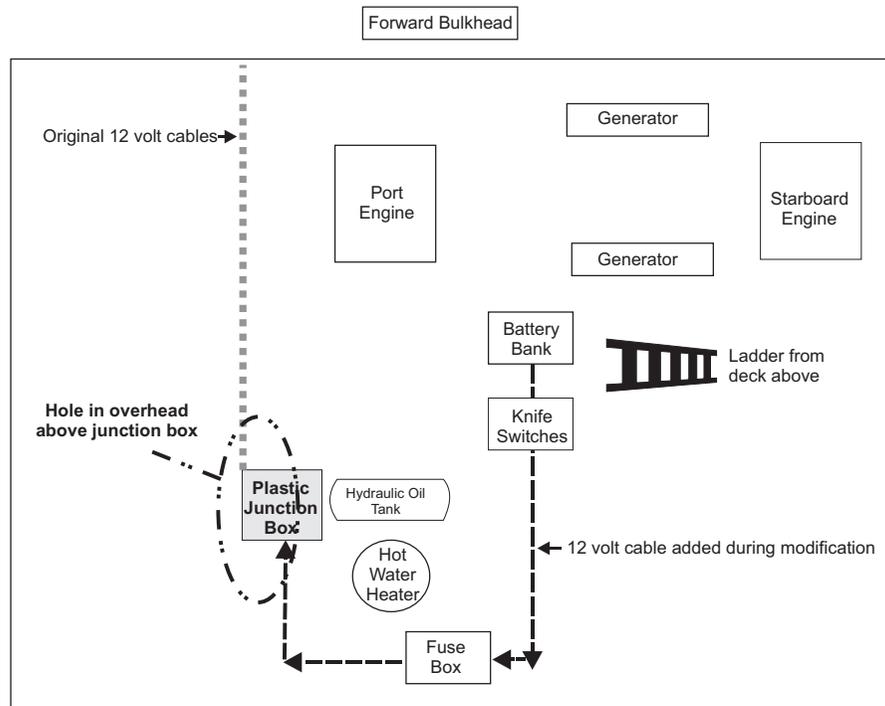


Figure 3. In 1992, the electrical system was modified and the battery backup was relocated from the forward bulkhead to beneath the access ladder. New wiring extending from the batteries was joined to the previous wiring in a plastic junction box on the port bulkhead. During postaccident examination, investigators observed a hole in the overhead, above the junction box.

Electrical System

Requirements Pertaining to Modifications. Federal regulations at 46 CFR 176.700 stipulate that other than in-kind repairs or equipment alterations that affect the safety of a vessel must not be made without the approval of the Coast Guard. A vessel owner must submit drawings or written specifications describing the proposed alteration to the OCMI for review before work can be started. Moreover, the OCMI can require an inspection and testing of the repair or alteration after it is made.

1992 Modification. The *Port Imperial Manhattan* originally had been equipped with a 32-volt DC main engine starting system, and the batteries for the system had been located at the forward bulkhead. In 1992, NY Waterway converted the main engine electric starting system to one using compressed air, and two 12-volt batteries were installed to supply the remaining direct current electrical loads.

The 12-volt batteries were installed beneath the access ladder, at the aft end of the engineroom compartment, which was beyond the reach of the existing wiring for the starting system. To bridge the gap between the existing wiring and the batteries, a new copper feed wire and a new junction box were installed. No. 2 American wire gauge (AWG) copper wires connected the two 12-volt batteries to knife switches.¹⁰ In the event one battery died, a third knife switch could provide crossover capabilities.

According to design guidance for electrical systems below 50 volts, No. 2 wire can safely carry about 100 amps of current.¹¹ Additional design requirements for wire sizing require that the wire be of sufficient size as to limit the voltage drop to the load to not more than 10 percent.¹²

In the wheelhouse, the supply load from each 12-volt battery passed through a forward distribution panel, which had a total load of 55.8 amps, and an aft distribution panel, which had a total load of 42 amps. The distance from the batteries to the distribution panels was about 100 feet. According to design guidance for limiting circuit voltage drop, the size of wire needed to supply a 56-amp load to the forward distribution panel on the bridge is AWG No. 0.¹³

Output from the knife switches fed to individual fuses, each of which was rated at 100 amps, according to information provided by the company. Fuses are current-sensitive devices designed to act as a weak link in an electrical circuit. They are intended to protect circuit components, such as power sources, loads, and the wires that connect sources to loads, from overheating as a result of excessive current. Title 46 CFR 05-50(c)(1991

¹⁰ A knife switch is a switch in which contact is made by sliding a blade between two contacts to close the electrical circuit.

¹¹ 46 CFR 183.05-45 (1991 edition) provides guidance on wire sizes for lighting and power wiring of less than 50 volts. Depending on insulation temperature rating, the Coast Guard allows No. 2 AWG wire to carry either 95 or 115 amps.

¹² 46 CFR 183.05.45(c) (1991 edition)

¹³ The formula specified in 46 CFR 183.05.45(c) (1991 edition) is used to calculate the required wire area in circular-mils, which is then converted to the corresponding AWG wire size using standard tables.

edition) required that conductors be protected from overcurrent in accordance with their current carrying capacities.

Federal regulations allowed for the use of splices and joints, provided they were installed in junction boxes. In addition, regulations did not prohibit the use of junction boxes constructed of plastic.¹⁴ According to the NY Waterway port engineer, the electrical cables had run from the fuse box into a plastic junction box, which had been installed above a reservoir tank for hydraulic oil. During postaccident examination, Safety Board investigators found no junction box among the debris. Investigators, therefore, examined the junction box on the *Port Imperial New Jersey*. At the junction box, lug bolts to the 12-volt DC wires connected the original to the modified section of the system. The wires from the junction box ran through the forward bulkhead to the two 12-volt independent distribution power panels in the pilothouse.

Following its investigation of the *Port Imperial Manhattan* fire, the Coast Guard issued a casualty report that states, in part, the following:

The existing cables were not long enough to reach the new battery location so a junction box was installed to extend the cable. Coast Guard approval was not sought for modification, and no electrical plans were submitted. The cause of the fire appears to be attributed to an incorrect electrical connection within the junction box....

The electrical modifications should have been subject to a review by the Coast Guard. By failing to provide notice of the intended changes NY Waterway precluded the Coast Guard from identifying any deficiencies....

Lifesaving and Firefighting Equipment

The *Port Imperial Manhattan's* COI stipulated the lifesaving and firefighting equipment required by Subchapter T regulations at Parts 180 and 181, respectively.

Lifesaving Equipment. The required lifesaving equipment carried by the *Port Imperial Manhattan* included 2 ring buoys with lights, 1 ring buoy with lights and a 60-foot line, 1 man-overboard ladder, and 354 lifejackets. Investigators determined that most of the lifejackets on the vessel had been tightly wrapped, fastened with clips, and stowed in two lockers at the aft end (figure 2). Adult- and child-size lifejackets had been stowed together.¹⁵

The *Port Imperial Manhattan* was not required by 46 CFR 180.207(d) to carry any RBAs, but voluntarily carried seven of the devices. (See figure 4.)

Firefighting Equipment. The *Port Imperial Manhattan* had a fire main, which could be supplied with water from two fire pumps, both of which were located in the engineroom and neither of which was remotely operated. The main fire pump was driven

¹⁴ 46 CFR .05-50(b) (1991 edition)

¹⁵ Title 46 CFR 180.78, "Stowage of Life Jackets," states that each child-size lifejacket must be stowed in a location that is appropriately marked and separated from adult lifejackets.

by the vessel's main engine. To engage the pump, a crewmember had to enter the engineroom. The secondary pump was an electrically driven pump that, in normal operations, functioned as a bilge pump for the vessel. To use the bilge pump for firefighting operations, crewmembers had to enter the engineroom and realign the valves to the pump so that it would draw from the sea chest¹⁶ and pump water into the fire main.



Figure 4. Postaccident view of two RBAs retrieved by crewmembers on board the *Port Imperial Manhattan*. An RBA lacks a platform to carry survivors. The ring-shaped flotation device is surrounded by a line that survivors in the water can grasp until they are rescued. On the night of the *Port Imperial Manhattan* fire, the lines of the vessel's RBAs became tangled, and crewmembers cut some of them to free the devices.

The vessel had two 1 1/2-inch fire hose stations in the main cabin, one hose on the upper deck, and six portable fire extinguishers installed as indicated below:

Pilothouse	One 2 1/2-pound (lb) and one 10-lb dry chemical extinguisher
Forward main deck	One 15-lb CO ₂ extinguisher
Engineroom	Two 15-lb CO ₂ extinguishers
Stern	One 15-lb CO ₂ extinguisher

¹⁶ The sea chest is a water intake space on either side of the ship, under the waterline, near the engineroom, which feeds water into the engines to cool them.

The *Port Imperial Manhattan* did not have either a fixed fire detection system or a fixed fire suppression system in its engine room; the vessel was not required to have such systems. Federal regulations at 46 CFR 181.155 stipulate that a vessel constructed, converted, or issued an initial COI on or before March 10, 1996, is exempt from the requirement for fire detection systems unless the vessel's hull or machinery space boundary bulkhead or deck is composed of wood or fiber-reinforced plastic or is sheathed on the interior with fiber-reinforced plastic. According to NY Waterway's senior director of marine operations, the *Port Imperial Manhattan* was the only vessel in the company's fleet that did not have a fixed firefighting system protecting the engine room. He said that the older vessels in the fleet had halon systems and the new vessels had CO₂ systems.

As part of this investigation, the Safety Board attempted to determine how many vessels certificated under 46 CFR Subchapter T operated in commuter service. Coast Guard records do not break down the total number of certificated vessels according to use. Coast Guard data does indicate that, as of April 2, 2001, the number of vessels under 100 gross tons totaled 5,613, of which 4,835 were built before March 11, 1996 and, thus, were not required to have fire protection equipment. Of these 4,835 vessels, 951 were certificated to carry more than 100 passengers.

Radiotelephones

The VHF radiotelephones on the *Port Imperial Manhattan* were not outfitted with an emergency source of power that enabled them to operate in the event of a power failure. Federal Communications Commission (FCC) requirements at 47 CFR 80.917, "Compulsory Radiotelephone Installation for Small Passenger Boats," stipulate the following under Reserve Power Supply:

- (a) A vessel of more than 100 gross tons the keel of which was laid after March 1, 1957, must have a reserve power supply located on the same deck as the main wheel house or at least one deck above the vessel's main deck, unless the main power supply is so situated.

Vessel Certification and Inspections

The *Port Imperial Manhattan* was last certificated on July 7, 1999, and the vessel's COI had an expiration date of July 7, 2002. Coast Guard regulations at 46 CFR 176.500 require that a vessel be reinspected within 60 days of the anniversary of the COI issuance date. The *Port Imperial Manhattan* had last been reinspected on June 7, 2000. During the reinspection, the Coast Guard inspector witnessed a simulated fire in the main cabin and a man-overboard drill. The inspector identified several minor deficiencies, none of which were related to the 12-volt electrical system.

Waterway Information

According to the National Ocean Service's publication *U.S. Coastal Pilot*, the Hudson River area between 38th Street in Manhattan and Lincoln Harbor in New Jersey is

about 3/4 mile wide and has an average depth of about 45 feet. Freshets,¹⁷ winds, and droughts influence the river currents. The currents usually set fair with the channels except near bends and wharves. The velocities of the currents average 1.3 to 1.6 knots.

Meteorological Information

According to area weather reports, the skies were partly cloudy and the visibility was good at the time of the accident. The wind was northeasterly at 10 to 16 knots. The air temperature was 45° F at 1900. The water temperature of the Hudson River, measured near Hastings-on-Hudson, 20 miles north of 38th Street, was 51° F.

Operations

General

NY Waterway began operations in 1986 as Port Imperial Ferry, providing passenger service across the Hudson River between New York and New Jersey. Before the *Port Imperial Manhattan* accident, the company had gone through a sustained period of growth, and, by 2000, had 23 existing vessels and one boat under construction. At the time of the accident, the company employed 113 masters and deckhands.

NY Waterway primarily operated the *Port Imperial Manhattan* as a commuter ferry that provided regularly scheduled passenger service across the Hudson River between 38th Street in Manhattan and Lincoln Harbor in Weehawken. In addition to 10 ferry routes, the company also operated sightseeing and dinner cruises and seasonal service to Yankee and Shea Stadiums. For most runs, in particular when providing commuter service between Manhattan and Weehawken, the company operated its vessels according to Coast Guard requirements contained in 46 CFR Subchapter T. When providing excursion service for a passenger complement that exceeded 150 people, the company operated the vessels according to Coast Guard requirements contained in 46 CFR Subchapter K.

Local Coast Guard officials stated that NY Waterway operates the largest fleet of small passenger vessels within the New York marine inspection zone. Agency officials stated that, according to Federal regulations, a NY Waterway vessel is not considered a “ferry” because it can be operated in different types of commuter service and is not limited to one strictly defined route.¹⁸ According to NY Waterway officials, at the time of the *Port Imperial Manhattan* fire, its vessels carried about 7 million passengers per year, mainly in

¹⁷ A freshet is a sudden overflow from a heavy rain or thaw into a body of water.

¹⁸ 46 CFR 2.10-25 defines ferry as a vessel that: (1) Operates in other than ocean or coastwise service; (2) Has provisions only for deck passengers or vehicles, or both; (3) Operates on a short run on a frequent schedule between two points over the most direct water route; and (4) Offers a public service of a type normally attributed to a bridge or tunnel.

commuter service. The company also used the vessels to conduct tours during noncommuting hours.

As a result of the damage to the Port Authority Trans-Hudson¹⁹ (PATH) commuter rail line and the New York City subway caused by the attack on the World Trade Center on September 11, 2001, the number of riders on NY Waterway vessels has greatly increased. Before the terrorist attack, NY Waterway typically carried 20,000 to 30,000 passengers each day. The company now averages 34,000 to 60,000 people per day. On the day of the attack, NY Waterway vessels evacuated more than 150,000 people from lower Manhattan, including 2,000 injured.²⁰

General Oversight

According to the company's senior director of marine operations, at the time of the *Port Imperial Manhattan* fire, he had three marine managers who provided general oversight for the vessels in the NY Waterway's fleet. Each of the managers had been a senior vessel master for the company. NY Waterway requires that a manager be on duty at all times between 0545 and 2100. Each marine manager is responsible for 8 vessels. The managers are required to ride on and to conduct an operational check of each of their vessels weekly. They are responsible for ensuring that the vessel masters submit deficiency reports, known as "Captain's Reports," on time, as required. The managers are also supposed to observe the performance of the vessel master and to provide mentoring, as necessary. The last operational check of the *Port Imperial Manhattan* before the accident was on October 17, 2000.

Electrical Maintenance

Industry Practices. According to recognized technical authorities, three fundamental rules for maintaining electrical equipment are: keep the equipment clean and dry, keep the electrical connections and mechanical fastenings tight, and inspect and test the equipment at sufficiently short intervals to ensure that it is in good operating condition.²¹

All electrical connections (particularly terminals and terminal board connections) should be inspected at frequent intervals to ensure they are tight.²² Loose connections result in increased contact resistance and increased heating, which may result in breakdown or a fire. Loose electrical connections or mechanical fastenings have caused numerous derangements of electrical equipment. Loose connections can be readily tightened, but a thorough inspection is necessary to detect them. A regular schedule of

¹⁹ Port Authority Trans-Hudson is a subsidiary of the Port Authority of New York and New Jersey. Trains operate between midtown Manhattan at 33rd Street to Newark, New Jersey.

²⁰ Source: *MarineLog*, January 2002-Vol.107 No.1. Information on the World Trade Center response is from the *MarineLog* Website, <www.marinelog.com>

²¹ *Naval Ships' Technical Manual*, Chapter 300, Electric Plant-General S9086-KC-STM-010/CH-300R4.

²² National Fire Protection Association's publication 70B, "Recommended Practice for Electrical Equipment Maintenance."

cleaning and inspection can ensure trouble-free operation and detection of incipient faults before they develop into a major source of difficulty. If the equipment manufacturer does not specify definite times for cleaning and inspection, a practical schedule for periodic cleaning and inspection at intervals sufficiently short to keep the equipment in good shape should be established. In setting up such a schedule, recognize that older equipment requires more frequent cleaning and inspection than similar equipment that has seen less service.²³

Company Procedures. NY Waterway provided maintenance and repair records for July 31 through November 14, 2000. The records indicate that NY Waterway had completed regular and breakdown maintenance for various engineering components, as well as minor preventive maintenance, such as changing oil filters. No documents indicated that the company had established a formal preventive maintenance program for the vessel's hull or its mechanical and electrical systems.

According to the port engineer, NY Waterway hired an electrical contractor to conduct maintenance and repair of the electrical systems on its vessels. The company's director of marine operations stated that a circuit test of the 12-volt circuit had been conducted before the accident but could not confirm the date of the last prefire check. A review of the maintenance records showed that on September 4, 2000, an electrical contractor made repairs after finding a knife switch disconnected and fuses blown on the 12-volt circuit. Otherwise, the company had no record of any electrical maintenance performed on the *Port Imperial Manhattan* before the fire and after July 31, 2000. Following the fire, NY Waterway developed a maintenance checklist for personnel to use when performing maintenance of all vessel systems, including electrical.

Toxicology Testing

NY Waterway arranged for all three *Port Imperial Manhattan* crewmembers to receive postaccident drug and alcohol testing about 2115 at Palisades General Hospital. All samples tested negative for the presence of alcohol and drugs.

Wreckage

On November 18, Safety Board investigators examined the damage on the *Port Imperial Manhattan*. The pilothouse suffered smoke damage, and the main passenger cabin was destroyed. The engineroom sustained extensive damage in the aft port corner. Investigators observed that the aluminum deck above the hydraulic oil tank had melted away. Hull frames on the port side aft suffered fire damage.

²³ *Naval Ships' Technical Manual*, Chapter 320, Electric Power Distribution Systems, S9086-KY-STM-010/CH-320R2.

Within the engineroom, investigators observed a “V” soot pattern on the interior skin of the ferry. The pattern pointed to the area where the plastic junction box had been installed. The junction box, however, was never located.

Copper wires to the 12-volt system showed beading.²⁴⁴ At the point where the junction box should have been located, the wire had completely burned through. The connections at the two lug nuts that connected the cables were loose. Investigators found severed wires that matched up to other wires of the 12-volt system and observed that the ends of the wires had beading.

Survival Factors

Emergency Actions of the Crew

The Safety Board interviewed 6 of the 8 passengers on board the *Port Imperial Manhattan* to gather information about the emergency response and the evacuation process. All of those interviewed said that the crewmembers gave their best effort during the fire but did not appear to be trained to handle the emergency.

Safety Placards and Briefings

Under 46 CFR 185.506, vessels under 100 gross tons must make a public announcement, referred to as a safety briefing, to passengers to familiarize them with lifesaving devices on board the vessel, including where to find and how to don lifejackets. In the case of the *Port Imperial Manhattan*, the Coast Guard had granted a waiver from the safety brief requirement because the voyage was less than 15 minutes in duration and because the vessel had posted placards containing information about the lifejackets. As a result, the passengers did not receive a safety briefing before departing the 38th Street terminal. One passenger stated that he knew where the lifejackets were stowed based on the placards.

Emergency Response

At 1906, the 911 emergency operator relayed a call from a passenger on board the *Port Imperial Manhattan* to the FDNY dispatcher. The passenger remained on the phone with the FDNY until all passengers and crew had been rescued. At 1907, the FDNY dispatcher notified the FDNY marine division of the fire, and a rescue boat, *Marine I*, was sent to the scene. About 1914, *Marine I* reported to the FDNY dispatcher that the passengers were about to be taken off the boat.

FDNY responders reported that they initially had some problems establishing the *Port Imperial Manhattan*'s location because they received conflicting reports of the vessel's position. The FDNY dispatcher received the first 911 call reporting the boat fire

²⁴ Beading of conductors are spherical formations of melted and resolidified copper that indicate excessive heat.

soon after the *Port Imperial Manhattan* had departed from the 38th Street terminal, and the *Marine 1* proceeded toward the terminal. Within 15 minutes of losing power, however, the burning *Port Imperial Manhattan* drifted almost 3/4 mile south. During this time, the FDNY dispatcher received additional calls reporting the vessel fire from several shoreside locations, including Hoboken and piers in Manhattan.

According to the crew of the *George Washington*, they initially tried to approach the *Port Imperial Manhattan* to offload the passengers and crew but were directed by *Marine 1* to back off. The fireboat then attempted to come alongside the *Port Imperial Manhattan*. When the *Marine 1* master realized that the fireboat's deck was higher than the *Port Imperial Manhattan*'s deck and that the passengers would not be able to easily climb aboard the rescue boat, the fireboat instructed the *George Washington* to go alongside the *Port Imperial Manhattan*. The *George Washington* successfully evacuated the passengers from the *Port Imperial Manhattan*.

Emergency Plans, Drills, and Exercises

NY Waterway provided the Safety Board with its *Marine Operations Manual*, which contains the following instructions to the crew for actions to take in the event of a fire:

1. Cut off the [fire's] air supply;
2. If a fire is in a machinery space, shut off fuel supply and ventilation;
3. Move passengers away from the fire and have them don lifejackets; and
4. If necessary, prepare to abandon ship.

The company provided an emergency checksheet for fires, which directed the crew to do the following:

1. For a fire at sea, cut off air supply to fire; close hatches, ports, doors, and ventilators.
2. For fire in the engine room, manually shut off fuel supply and ventilation in the burning space. Move passengers away from the fire and have passengers don lifejackets.
3. If necessary, prepare to abandon ship.

The company provided a record of fire drills conducted by all vessel masters from June 29 to November 6, 2000. The record does not indicate the names of the vessels on which drills were conducted or show any entry for an abandon ship drill.

The company provided copies of NY Waterway's drills and training records for the two most recent drills that the *Port Imperial Manhattan*'s master had performed. The master's comments did not describe the scenarios used in the drills.

The company provided a station bill. According to the bill, one of the duties of the master was to direct the efforts of the crew.

Other Information

Federal Regulations Pertaining to Vessel Maintenance

Title 46 CFR Subchapter T contains no section devoted to vessel maintenance. Regarding machinery on small passenger vessels, 46 CFR 182.100, states the following:

This part contains requirements for the design, construction, installation, and operation of propulsion and auxiliary machinery, piping and pressure systems, steering apparatus, and associated safety systems. Machinery and equipment installed on each vessel must be suitable for the vessel and its operation for the purpose intended. All machinery and equipment must be installed and maintained in such a manner as to afford adequate protection from causing fire, explosion, machinery failure, and personnel injury.

Postaccident Actions by NY Waterway

According to the New York Waterway senior director of marine operations, the *Port Imperial Manhattan* is being rebuilt under 46 CFR Subchapter K with Coast Guard approval. The rebuilt vessel will be outfitted with a fire detection and suppression system in the engine room.

In February 2001, NY Waterway began requiring its masters and deckhands to complete the Standards of Training, Certification, and Watchkeeping for Seafarers (STCW) 5-day basic safety training course at the SIU Piney Point training facility. The course has the following elements:

1. Personal survival, 12 hours (STWC A-VI/1-1);
2. Fire prevention and firefighting, 16 hours (STCW VI/1-2);
3. First aid/CPR, 8 hours (STCW VI/1-3); and
4. Social responsibility and personal safety, 4 hours (STCW A-VI/1-4).

As of the same date, the company requires its vessel masters to complete a radar observer course. NY Waterway instituted a program to qualify deckhands as senior deckhands in accordance with NVIC 1-91. In coordination with the Coast Guard, NY Waterway reviewed the electrical systems on the vessels in its fleet to determine whether any alterations not approved by the Coast Guard had been made. One such alteration was found and corrected to comply with Coast Guard specifications.

According to the company's port engineer, as of January 2002, all vessels in the NY Waterway fleet except the *Port Imperial New Jersey* had been modified so that lifejackets were stowed beneath the seats. The *Port Imperial New Jersey* is being modified so that lifejackets will be available throughout the vessel.

According to the company's senior director of operations, all company vessels have been outfitted with emergency backup power for the VHF radiotelephone in the event of a primary power failure.

Passenger Vessel Association

The Passenger Vessel Association (PVA) serves the interests and concerns of more than 350 vessel owners and operators in the domestic passenger vessel industry, which represents about 65 percent of the industry nationwide. Association members operate more than 1,100 passenger vessels in the United States carrying up to 200 million passengers annually. PVA members offer services including dinner cruises, tour and excursion services, car and passenger ferries, private charters, whale watching trips, overnight cruises, and riverboat gaming.

The PVA has a safety and loss control committee responsible for reviewing, developing, and implementing programs to encourage enhanced training and safety capability among its members. These programs are designed to improve the loss record for the industry. The PVA has published risk management and training manuals to assist its member companies improve the safety of their passenger vessel operations. The risk management manual includes a safety audit guide containing inspection checklists for identifying hazardous conditions that could lead to slips, trips, falls, and other injuries to passengers and crewmembers. The manual mentions that engineroom safety and deck equipment inspection logs are useful for conducting proper maintenance.

The training manual provides information for training deckhands in several areas, including safety precautions for engineroom operations. The manual contains a primer on small passenger vessel machinery operations and systems.

Analysis

This analysis first identifies factors that can be readily eliminated as causal or contributory to the fire and determines where and how the fire started and how it spread. The report then discusses the following major safety issues:

- Vessel maintenance;
- Fire detection and suppression systems;
- Crew response to the emergency;
- Lifejacket stowage;
- Safety information provided to passengers; and
- Vessel communications.

Exclusions

The weather conditions at the time of the fire were not severe and did not hamper detection of the fire or interfere with the firefighting efforts. The three crewmembers underwent toxicological testing about 2 1/4 hours after the fire was discovered and tested negative for the use of drugs and alcohol. Although the toxicological testing was not done within 2 hours of the accident, it was accomplished timely enough to be meaningful. The master stated that, during the 72-hour period before the accident, he received his normal amount of rest, which typically was 8 hours each night. This amount of rest usually is adequate to prevent fatigue. The Safety Board, therefore, found no evidence that he had been impaired due to lack of sleep. Consequently, the Safety Board concludes that none of the following were factors in this accident: weather, operator fatigue, drugs, or alcohol.

Accident Analysis

Shortly after the small passenger vessel *Port Imperial Manhattan* departed the 38th Street Terminal Pier with a complement of 3 crewmembers and 8 commuters, a fire started in the vessel's engine room, which was beneath the main passenger cabin. The vessel was not equipped with a fire detection system; therefore, the crew received no early notice of the fire. Crewmembers attempted to fight the fire using portable extinguishers; however, the fire was beyond their capability to bring it under control with the available equipment. The vessel lost propulsive power and steering and began to drift. The fire spread throughout the main passenger cabin, forcing the crew and passengers to evacuate the interior spaces and gather on the foredeck. Another company ferry rescued the crew and passengers, and an FDNY vessel towed the burning ferry to Manhattan, where shoreside

firefighters extinguished the fire. No deaths resulted from this accident; one passenger was treated for smoke inhalation.

Cause and Origin of the Fire

Safety Board investigators and party representatives inspected the engineroom and found the most significant damage in the port aft corner. In this area, the aluminum deck above the hydraulic oil tank had melted completely from the intense heat. The interior skin of the ferry had a “V” soot pattern. The base of the V in a soot pattern can be an indication of where the fire originated. In this case, the base of the V pointed toward the area of the hydraulic oil tank in the port aft corner of the engineroom. In postaccident interviews, the deckhands reported seeing flames between the treads of the ladder leading into the engineroom space.

From interviews with company personnel, investigators determined that, during a 1992 modification of the electrical system, a 32-volt DC main engine starting system had been removed from its original position at the forward bulkhead of the engineroom and had been replaced with two 12-volt batteries that were installed at the aft end of the engineroom, beneath the access ladder. As installed, the 12-volt batteries had been beyond the reach of the existing wiring for the starting system. To bridge the gap between the existing wiring and the batteries, No. 2 AWG copper wires had been run from the old battery bank location to the new position. Two lug bolts had connected the new and old wires, and the connections had been enclosed in a plastic junction box, which had been installed over the hydraulic oil tank in the port aft corner of the engineroom.

The Coast Guard report of findings in this accident found that the No. 2 AWG wire was undersized, that the protecting fuse was oversized, and that these conditions contributed to the cause of the fire. In the Safety Board’s opinion, these conditions probably were not causal or contributory to the fire. The No. 2 AWG wire installed in the system could safely handle up to about 100 amps current, and the full load to the forward distribution panel was only 55 amps. The conductors were undersized only in the sense that a voltage drop would have exceeded the recommended maximum of 10 percent and not because the conductors could not safely carry the current of connected load. Even though the 100 amp fuses exceeded 125 percent of the connected load, they would have adequately protected the No.2 AWG wire from overheating caused by high currents.

Investigators could not locate the plastic junction box, which was probably destroyed in the fire. They did find the lug nut connection holding the old and new wires; however, the wires on either side of the lug nuts had burned through. Much of the wire’s insulation had been burned off, with most of the damage closest to the point where the old and new wires were connected. The lug nuts connecting the wires were loose. The 12-volt DC cables matching other sections of the electrical system had sustained heavy damage. The cables showed evidence of beading, which indicates a high temperature condition.

After finding the loose connections at the lug nuts on the *Port Imperial Manhattan*, investigators checked the junction box on the *Port Imperial New Jersey* and found similar loose connections. The *Port Imperial New Jersey*'s wires also showed evidence of beading, indicating a high temperature condition associated with arcing activity.

In high current electrical wiring connections, excessive temperatures can develop at the junction due to excessive voltage drop caused by high resistance from corroded or loose connections.

Wiring problems stem from using inadequate gauge wire for the load carried or from running the wire too great a distance for its design. After the conversion, NY Waterway had an electrical contractor periodically perform circuitry tests of the *Port Imperial Manhattan*'s electrical system. Records reveal that the system had not indicated an overload condition during the tests. Moreover, during the 8 years from the time that the direct current electrical systems of the *Port Imperial Manhattan* and the *Port Imperial New Jersey* had been modified, neither vessel had experienced any incidents or had reported problems related to the systems. If the wiring had not been adequately sized to handle the connected load, electrical problems probably would have occurred earlier, given the constant use of the vessels. For 16 hours each day, the *Port Imperial Manhattan* made commuter runs every 15 minutes during rush hour periods and sightseeing tours, dinner cruises, and other runs during off-peak periods.

High resistance connections can be caused by a poor splice, loose or intermittent connections, or by corroded connections. After the fire, investigators found loose wire connectors on the wire ends where the old and new wires were joined during the 1992 system modifications. The probability is high that, if the connections were left unchecked over an 8-year period, vibration and thermal cycling caused them to loosen. A loose connection would increase electrical resistance in the circuit, causing the wire at the connection to overheat, which, in turn, could result in the insulation igniting.

The hydraulic oil on board the *Port Imperial Manhattan* was Mobil Hydraulic Oil AW 32, which according to the "Material Safety Data Bulletin," has a flash point of 374° F. At normal temperatures, a spark will not easily ignite this hydraulic oil because it doesn't produce sufficient flammable vapors. However, an established fire will ignite a pool of oil by providing enough heat to raise the liquid to its flashpoint.

In this case, the fire from the burning wire insulation and surrounding materials would provide enough heat to raise the oil to its flashpoint. The temperature rise would have caused the oil to produce sufficient vapors to be ignited. The burning debris would have dropped into the bilges and ignited any other combustible debris or accumulated standing hydraulic oil. Finally, the hydraulic oil tank would have ignited, providing fuel for the fire. The Safety Board concludes that the fire on the *Port Imperial Manhattan* started in the junction box as a result of a loose connection and spread throughout the after portion of the engine room. The open access door then allowed the fire to spread to other areas of the vessel.

Coast Guard inspectors had not detected the electrical system modification during their annual examinations of the *Port Imperial Manhattan*. A review of Coast Guard inspection records showed that these routine inspections included visual examinations of the vessel's hull and of lifesaving and firefighting equipment. In addition, the inspectors conducted operational tests of the fire pumps and other systems, such as main propulsion and steering. These inspections appeared to have been reasonably thorough and complete.

During routine Coast Guard examinations, the inspectors do not perform an in-depth review with plans. Unless inspectors note an obvious defect or improper installation, they would not trace individual electrical circuits or check individual electrical connections. In the case of the *Port Imperial Manhattan* arrangement, the modification to the 12-volt electrical system consisted of running standard No. 2 AWG cable to a junction box. Because cable runs with junction boxes are common on board vessels, the arrangement would have appeared to be in accordance with standard marine practice. An inspector would have had no reason to suspect that the Coast Guard had not previously approved the wiring installation. When inspecting batteries, inspectors typically focus on proper installation, proper ventilation to dissipate gas generated during charging, and proper terminal connections.

The Safety Board therefore, concludes that a routine Coast Guard inspection of the vessel probably would not have detected the loose electrical connection that led to the fire on the *Port Imperial Manhattan*.

Vessel Maintenance

NY Waterway did not have a preventive maintenance program for the hulls, the mechanical systems, and the electrical systems of the vessels in its fleet. Documentation provided by the company indicated that engineroom inspections had been made, but omitted details indicating the scope of the maintenance performed and the intervals between the maintenance. Company officials stated that a circuit check on the 12-volt system had been conducted, but could not say when it had been performed. Preventive maintenance of the electrical system would have included testing the circuits and tightening the bolts in the junction box, which loosened over time and caused the fire.

Several methods are commonly used to detect faulty connections, including resistance testing of the electrical system with a micro-ohmmeter to detect high resistance that results in high temperatures and excessive voltage drops. Infrared thermographic imaging of electrical system components operating under full load can also detect high temperature conditions resulting from high resistance connections. Infrared thermographic imaging is widely used in many industries as means of locating electrical system components operating at higher temperatures than adjacent components, and is able to detect temperature differences of as little as 2° F. A junction box containing a hot connection would have been easily detectable by a modern infrared imaging device well before the problem became serious enough to cause a fire. The Safety Board concludes that had NY Waterway had an effective preventive maintenance program, the loose

electrical connection could have been detected before it caused the fire on the *Port Imperial Manhattan*.

After the fire, the company introduced additional checksheets to improve the monthly maintenance of its vessels. However, this alone is not equivalent to implementing a comprehensive preventive maintenance program, which is much broader in scope.

While this accident resulted from inadequate maintenance of the electrical system, passenger safety cannot be ensured by maintenance of electrical systems alone. Several small passenger vessel accidents investigated by the Safety Board show that inadequate preventive maintenance of hull and machinery systems played an equally significant role in causing accidents. Shipboard mechanical systems consist of numerous moving parts that require planned inspections and maintenance to avoid unexpected breakdowns and unsafe conditions for passengers and crew. It is therefore necessary for companies to develop a preventive maintenance program for all systems affecting the safety of passenger vessels.

A company's preventive maintenance program for its vessel fleet should include, as a minimum, established procedures for reporting maintenance and repair needs, for ensuring good interaction between vessel-operating personnel and shoreside maintenance staff, for conducting vessel inspections and repairs, for verifying and/or testing repairs, for retaining and reviewing maintenance and repair records, and for overseeing the maintenance and repair process. The Safety Board therefore believes that, for the vessels in its fleet, NY Waterway should develop and implement a preventive maintenance program for systems affecting safe operation, including the hull and the mechanical and electrical systems.

The Coast Guard does not have specific regulations requiring a preventive maintenance program for small passenger vessels. The Federal regulators of other transportation modes recognize the importance of preventive maintenance to the safety of operations and require that operators have a systematic program for performing inspections and maintenance. The Federal Aviation Administration has promulgated for all airplane operators comprehensive maintenance requirements, which include provisions for inspections, repairs, and preventive maintenance.²⁵ The Federal Motor Carrier Safety Administration requires that every motor carrier systematically inspect, repair, and maintain, or cause to be systematically inspected, repaired, and maintained, all motor vehicles subject to its control.²⁶ In addition, the Federal Railroad Administration has extensive inspection and maintenance requirements for locomotives, train cars, crossing signals, and tracks.²⁷

Because no authority other than the Coast Guard exercises oversight over domestic small passenger vessels, the Safety Board believes that the Coast Guard should require that companies operating domestic passenger vessels develop and implement a preventive

²⁵ These requirements are contained in 14 CFR Part 43, and Part 91, subpart E.

²⁶ Maintenance requirements are specified at 49 CFR 393.3.

²⁷ Inspection and maintenance requirements are specified at 49 CFR parts 213, 215, 229, and 231.

maintenance program for all systems affecting the safe operation of their vessels, including the hull and the mechanical and electrical systems.

More than 350 small passenger vessels owners and operators, or about 65 percent of the owners and operators nationwide, belong to the PVA. The Safety Board is aware that an objective of the PVA is to assist its member companies improve the safety of their passenger vessel operations, and the association has published risk management and training manuals for that purpose. The risk management manual includes a safety audit guide containing checklists for inspecting vessels for hazardous conditions that could lead to slips, trips, falls, and injuries to passengers and crewmembers. The manual briefly mentions that engineroom, deck equipment, and safety inspection logs are useful for conducting proper maintenance. The training manual provides information for instructing deckhands in several areas, including safety precautions for engineroom operations. The training manual also contains a primer on small passenger vessel machinery operations and systems.

While the PVA's voluntary guidelines cover several areas of passenger and vessel safety, they do not provide adequate guidance to companies for establishing preventive maintenance programs for the hull and the machinery and electrical systems. In addition to operational checks, PVA guidelines should stress the importance of vessel maintenance and list machinery, electrical, and hull items that require periodic inspection and maintenance by a company's maintenance staff. The guidelines for preventive maintenance should describe, for example, procedures for reporting maintenance and repair needs, for ensuring good interaction between vessel-operating personnel and shoreside maintenance staff, for conducting vessel inspections and repairs, for verifying and testing repair work, for retaining and reviewing maintenance and repair records, and overseeing the maintenance and repair process for its fleet. Given the large number of passengers that are carried on small passenger vessels and ferries today and the commensurate safety risks, preventive maintenance should be performed on a regular basis.

Although the PVA does not include the entire domestic small passenger vessel fleet, its members represent a large enough portion of the industry to incrementally improve the level of small passenger vessel safety. Recognizing that Coast Guard rulemaking requiring preventive maintenance programs is likely to be a time-consuming process, the Safety Board believes that, in the interim, the PVA should provide its members with guidelines for developing a preventive maintenance program for all systems affecting the safe operation of their vessels, including the hull and the mechanical and electrical systems.

Fire Detection and Suppression Systems

Fire Detection

In this accident, the fire on the *Port Imperial Manhattan* was probably in its incipient stage²⁸ for some time before entering the free-burning phase. Unfortunately, the crewmembers were unaware of the fire until it was fully involved in the engine room. A fire detection system in the engine room would have probably detected the fire while it was in the incipient phase and would have alerted the crewmembers to the presence of a fire while it was still small enough for them to be able to extinguish it. However, the *Port Imperial Manhattan* did not have a fire detection system for its engine room. Once the fire reached the free-burning stage, the crewmembers were faced with a much more serious and life threatening blaze.

According to Federal regulation, a vessel constructed, converted, or issued an initial COI on or before March 10, 1996, is exempt from the requirement for fire detection systems unless the vessel's hull or machinery space boundary bulkhead or deck is composed of wood or fiber-reinforced plastic or its interior is sheathed with fiber-reinforced plastic. Because the *Port Imperial Manhattan* was built of aluminum in 1987, it was not required to have a fire detection system.

The Safety Board does not consider the date of build, conversion, or certification to be an appropriate factor for determining whether a vessel should or should not be required to have an installed fire detection system. The sole reason for requiring the installation of such a system should be the risk factors involved. As is the case with most small passenger vessels, the engine room on the *Port Imperial Manhattan* was unmanned; no one was in the space to continuously monitor the fire-safe condition. Because the engine room is the location of most ignition sources for fires, including hot surfaces, fuel and lubricating oils, and electrical equipment, this space is where the greatest fire risk exists on a vessel. Moreover, as the service life of a vessel increases, the potential for failure or breakdown in system components increases. As they age, engine hoses deteriorate, electrical parts fail, and the overall condition of an engine room declines.

Because new small passenger vessels are required to have fire detection systems to protect their engine rooms and older existing vessels in the same service are not, two standards of safety exist. More importantly, the vessels with the higher risk are permitted to adhere to the lower standard. The Safety Board concludes that the lack of fire detection systems for engine rooms on existing small passenger vessels in commuter and ferry service presents an unacceptable risk to passengers and crewmembers. Consequently, the Safety Board believes that the Coast Guard should require that all small passenger vessels

²⁸ The first stage of a fire, known as the incipient stage, begins at the moment of ignition. During this stage, the flames are localized, and the fire is fuel-regulated, meaning the fire is regulated by the configuration, mass, and geometry of the fuel. In the incipient stage, the oxygen content is within normal range, and normal ambient temperatures still exist. Source: NFPA, *Fire Ignition & Development*, Catalog No. VC-54 (Quincy, Massachusetts: NFPA: 1998)

in commuter and ferry service, regardless of their date of build, be fitted with a fire detection system in the enginerooms.

Fire Suppression

From the time that crewmembers discovered the *Port Imperial Manhattan*'s fire, it was beyond their capability to extinguish it with portable fire extinguishers. The vessel's fire main system was charged by a primary fire pump, which, in turn, was driven by the main diesel engine. The deckhands would have had to enter the engineroom in order to start the pump; however, they could not do so because the engineroom was on fire. The auxiliary fire pump served as a bilge pump during normal operations. However, to align the valves and activate the pump so that it would provide water to the fire main, the deckhands would have had to enter the engineroom, which was not possible.

Title 46 CFR 181.300(e) require that "new" small passenger vessels, that is, those built, converted, or issued an initial COI on or after March 11, 1996, have a fire pump that is capable of both remote operation from the operating station and local operation at the pump. Because the *Port Imperial Manhattan* was built before this cut-off date, it was not required to have remotely operated fire pumps. Had the fire pumps on the *Port Imperial Manhattan* been capable of remote operation, the deckhands might have been able to charge a fire hose and to use it to fight the fire. However, it would have been extremely dangerous for anyone who was not properly trained and equipped to enter an enclosed space to fight a fire. Nevertheless, the deckhands on the *Port Imperial Manhattan*, operating from the main passenger cabin, could have directed a stream of water into the engineroom through the open access trunk, which might have knocked down the fire, or they could have used the charged fire hose to cool the fire boundaries and possibly limit the spread of the fire.

Consequently, the Safety Board concludes that the lack of remotely operated fire pumps on the *Port Imperial Manhattan* compromised the ability of the crew to control the fire and that the lack of a remotely operated fire pumps on other small passenger vessels in commuter and ferry service built before March 11, 1996, similarly impairs the ability of their crews to control engineroom fires. The Safety Board, therefore, believes that the Coast Guard should require that all small passenger vessels in commuter and ferry service, regardless of their date of build, be fitted with remotely operated fire pumps.

In the Safety Board's opinion, the most effective method that the crewmembers could have used to extinguish this fire would have been to seal the engineroom by closing all vent openings and doors and then activate a fixed fire suppression system. Unfortunately, the *Port Imperial Manhattan* was not equipped and was not required to be equipped with a fixed fire suppression system to protect its engineroom. If the *Port Imperial Manhattan* had been equipped with a fixed fire suppression system, it could have extinguished the fire before it spread to other parts of the vessel, thus limiting the damage to the vessel and the threat to the people on board. Further, it would have freed the deckhands of active firefighting duties and allowed them to concentrate their efforts on taking care of the passengers during the fire emergency.

The value of a fixed fire suppression system was graphically demonstrated in a more recent fire on board another small passenger vessel in commuter service. On September 28, 2001, a fire broke out in the engine room of the small passenger vessel, the *Seastreak New York*,²⁹ which was in commuter service between Highlands, New Jersey, and Manhattan. Because the engine room on the *Seastreak New York* was fitted with a CO₂ fire suppression system, when crewmembers discovered the fire, they were able to activate the suppression system without having to enter the engine room and extinguish the fire before it caused extensive damage to the vessel. Thus, the vessel firefighters were in less danger, and the fire was extinguished in a quick and effective manner.

The Port Imperial Manhattan and the *Seastreak New York* were both in commuter passenger service; both vessels had enclosed, unmanned engine rooms; both vessels were certificated to carry hundreds of passengers at one time; both vessels were similarly manned, and both vessels suffered an engine room fire. However, while its fire virtually destroyed the *Port Imperial Manhattan*, the fire on the *Seastreak New York* caused only minor damage. The difference between the outcomes of these two fires was that the *Seastreak New York* was outfitted with a fixed fire suppression system to protect its engine room and the *Port Imperial Manhattan* was not. Had the *Port Imperial Manhattan* been equipped with a fire suppression system to protect its engine room, the outcome of the fire could have been markedly different. The Safety Board, therefore, concludes that, if the *Port Imperial Manhattan* had been equipped with a fixed suppression system, properly trained crewmembers could have extinguished the fire and kept it within the confines of the engine room.

At the time of the fire, the *Port Imperial Manhattan* was the only vessel in NY Waterway's fleet that did not have a fire detection and suppression system protecting its engine room. As a result of this fire, NY Waterway plans to rebuild the *Port Imperial Manhattan* with a detection and suppression system for its engine room. Because all other vessels owned or chartered by NY Waterway already have the detection and suppression systems, further action by NY Waterway is not warranted on these issues.

The small passenger vessel industry continues to grow, and other owners and operators presently have many existing vessels in service. While the Safety Board could not determine how many vessels certificated pursuant to Subchapter T were operating in commuter service, Coast Guard records indicate that of 4,835 small passenger vessels built before March 11, 1996, 951 were permitted to carry in excess of 100 passengers. Further, PVA records indicate that its member companies, which have about 65 percent of the small passenger vessels in service nationwide, carry up to 200 million passengers annually. Because existing vessels are not required to have fire suppression systems in their engine rooms, the passengers on board these vessels are at increased risk. The Safety Board concludes that the safety of existing small passenger vessels in commuter and ferry service would be enhanced by the installation of fire suppression systems in their engine rooms. Consequently, the Safety Board believes that the Coast Guard should

²⁹ The *Seastreak New York* fire will be the subject of a separate Safety Board report.

require that all small passenger vessels in commuter and ferry service, regardless of their date of build, be fitted with a fixed fire suppression system in their engine rooms.

Crew Response to the Emergency

In response to the fire on board the *Port Imperial Manhattan*, the crewmembers' first actions were directed at locating and fighting the fire and then at securing the safety of the passengers. This section will first examine the crewmembers' firefighting response and then their efforts in providing for passenger safety.

Crew's Firefighting Response

The first indication of fire on board the *Port Imperial Manhattan* was when the master observed smoke coming from the engine room vent on the upper deck. He immediately dispatched deckhands to investigate the source of smoke. Given that the vessel lacked a fire detection system, the master's action was appropriate for he had no other way in which to learn what was causing the smoke.

Upon arriving at the access door to the engine room, the deckhands did not follow accepted firefighting procedures for opening a door into a space suspected of being on fire. They did not move the back of their hands over the outer surface of the door to check for heat before opening it. Rather, they simply opened the engine room door, which not only allowed additional oxygen to enter the area and feed the fire but also put them at risk of injury. Further, a door to an enclosed space suspected to be on fire should not be opened unless firefighters are on hand with a charged fire hose.

Once they identified that a fire was in the engine room, the crewmembers did not immediately notify the master. Rather, they both tried to extinguish the fire, with no success, before one of the men returned to the pilothouse and advised the master about the fire.

In their attempt to put out the fire, the deckhands stood at the open doorway to the engine room and discharged portable CO₂ extinguishers at the flames, which was completely ineffective. A portable extinguisher has a limited range and must be directed at the seat of the fire to be effective. Because the crewmembers could not enter the engine room, they could not get close enough with the portable extinguishers to have any effect on the fire. Their actions demonstrated that they were not properly trained in the use and limitations of the various types of fire extinguishers. If they had been properly trained, they would have known that they could not control or extinguish a fire from a distance with portable devices.

Other actions of the deckhands exacerbated the fire and smoke conditions, which again demonstrates that they did not know how to properly respond to the fire. Before leaving the main cabin, one deckhand opened the exterior door to the stern to allow smoke to dissipate from the main cabin. After evacuating the main cabin, crewmembers did not

close the exterior stern door or the engineroom door. By leaving the doors to the engineroom and to the exterior stern open, the crew provided a source of fresh air to the fire and a pathway that allowed the fire and smoke to spread beyond the confines of the engineroom into the main passenger cabin, eventually filling the main cabin with thick black smoke.

The crewmembers of the *Port Imperial Manhattan* did not use proper firefighting techniques; thus, they were ineffective in controlling or extinguishing the fire. They did not take appropriate actions to prevent the heat and smoke of the fire from spreading to other parts of the vessel, which endangered their own safety and the safety of the passengers. In the Safety Board's opinion, the crewmembers' inability to appropriately respond to this emergency was the direct result of a lack of adequate training.

Federal regulations do not require that the masters and deckhands on small passenger vessels undergo formal firefighting training. Rather, the requirements at 46 CFR 185.420 and 185.520 stipulate, in part, that the owner, charterer, master, or managing operator provide "instruction" to newly hired deckhands as to "the duties that the crewmember is expected to perform in an emergency" and that the master "conduct sufficient fire drills to make sure that each crew member is familiar with his or her duties in case of a fire." The format and depth of the required instruction for new deckhands is not specified in the regulations but is left to the discretion of the individual company. Likewise, the requirement for masters to hold "sufficient fire drills to make sure that each crewmember is familiar with his or her duties" is subject to discretionary compliance in so far as the depth of "familiarity" with duties is concerned. However, because masters are not required to complete fire training, they are ill-prepared to provide training to others or to evaluate the effectiveness of drills.

The required instruction and drills aim at familiarizing crewmembers with duties to be performed during an emergency; the regulations do not require that crewmembers receive in-depth knowledge and training in how to perform those duties. Before the fire, NY Waterway, in accordance with Federal regulations, had provided basic familiarization instruction to its new employees and had required that regular fire drills be held under the direction of the vessel master. The instruction and drills, however, were not adequate to enable the crew to properly respond to the fire on the *Port Imperial Manhattan*.

The Safety Board, therefore, concludes that the crewmembers' firefighting efforts were ineffective in controlling or extinguishing the *Port Imperial Manhattan* fire because they lacked adequate firefighting training.

The Safety Board has investigated past accidents on small passenger vessels where crew training in emergency procedures was a concern. On December 3, 1994, the small passenger vessel *Argo Commodore*, with 4 crewmembers and 41 passengers on board, was about 1 hour into a dinner cruise of San Francisco Bay, California, when crewmembers discovered a fire in the engineroom. In analyzing the crew's handling of the emergency, the Safety Board found their response effort was inadequate, in part, because they had not participated in firefighting or evacuation drills and had been given ineffective on-the-job

training.³⁰ As a result of its findings in the *Argo Commodore* accident investigation, the Safety Board issued the following safety recommendations to the Coast Guard:

M-95-40

Establish mandatory standards for qualifications and training of crewmembers aboard small passenger vessels.

M-95-42

Verify crew competence and company preplanning for emergencies either by routinely witnessing emergency drills at every annual inspection or by some other means of regulatory oversight.

On January 10, 1996, the Coast Guard revised 46 CFR 185.524 requiring that Coast Guard marine inspectors conduct emergency drills during their annual inspections of vessels and log when such drills were conducted. In its August 6, 1996, letter advising the Safety Board of the regulatory change, the Coast Guard stated that the new requirement for on-board emergency training and drills satisfied the intent of both Safety Recommendations M-95-40 and M-95-42. The Safety Board agreed that the regulatory revision satisfied the intent of Safety Recommendation M-95-42 and classified that recommendation “Closed–Acceptable Alternate Action.” The Safety Board disagreed that the regulatory revision addressed the need for emergency qualification and training standards for crewmembers on small passenger vessels, and, on March 12, 1997, classified Safety Recommendation M-95-40 “Closed–Unacceptable Action.”

Effective marine firefighting requires responders to identify the phase and class of the fire and to determine the most efficient way to extinguish it. Firefighters have to understand basic fire chemistry, be aware of the causes of fire phenomena, such as flashover and backdraft, and know the procedures for properly executing both direct and indirect attacks on a fire. Firefighters must also know the proper use and limitations of extinguishing agents and firefighting equipment and the personal safety procedures to follow in conducting firefighting operations. From the actions of the *Port Imperial Manhattan*’s crewmembers during this emergency, it is clear that, despite participating in regular drills, the crew lacked the basic knowledge of proper firefighting procedures and that their lack of knowledge rendered their efforts ineffective.

There is a distinct difference between on-board drilling and formal training. Specifically, drilling reinforces training by applying the techniques learned to specific vessels and crews. As shown in the *Argo Commodore* and the *Port Imperial Manhattan* fires, such instruction and drills did not provide adequate training for the crews to respond correctly to the fire emergency. To its credit, NY Waterway has voluntarily instituted a new training program for all its crewmembers, including captains and deckhands, which

³⁰ For more information, see National Transportation Safety Board, *Fire Aboard U.S. Small Passenger Vessel Argo Commodore in San Francisco Bay, California, December 3, 1994*, Marine Accident Report NTSB/MAR-95-03 (Washington, DC: NTSB, 1995).

includes at least 1 day of training in marine firefighting. Such training probably should make the company's crews more knowledgeable of proper fire response measures.

The Safety Board considers it equally important for other small passenger vessel operators in the commuter trade to provide fire safety training to their deckhands. If a fire breaks out on board a commuter vessel, the deckhands will be required to fight or control it until outside assistance can arrive. For their safety and for the safety of the passengers on board, these deckhands should be trained in the proper procedures to follow and the actions to take for all foreseeable fire scenarios. The Safety Board concludes that the lack of formal emergency training for crewmembers on small passenger vessels leave them unprepared to handle emergencies and, therefore, creates an unsafe environment for the traveling public. The Safety Board, therefore, believes that the Coast Guard should establish firefighting training requirements for crewmembers on board small passenger vessels in commuter and ferry service.

The Safety Board recognizes that the regulatory process takes a long time to complete and is convinced that some interim measure to provide improved training for these deckhands is needed to improve fire safety on small passenger vessels. Currently, NVIC No. 1-91 provides the Coast Guard's only guidance to the small passenger vessel industry concerning fire training and qualifications of deckhands on small passenger vessels. This document, however, contains merely a general outline of subject areas that deckhands should "be familiar with" rather than detailed guidance. Small passenger vessels in commuter and ferry service carry millions of passengers each year and these vessels, as shown by the *Port Imperial Manhattan* and by the *Seastreak New York*, continue to be vulnerable to fire. In light of the time needed to promulgate new regulations and of the high number of passengers at risk, the Safety Board believes that, as an interim measure, the Coast Guard should revise NVIC No. 1-91 so that it provides more in-depth guidance in training and drills for firefighting on board small passenger vessels.

Safety of Passengers

The safety of the passengers was the primary responsibility of the master and crew of the *Port Imperial Manhattan*. However, based on the postaccident statements from the passengers on the *Port Imperial Manhattan*, they were left to their own devices and more or less fended for themselves throughout the emergency.

When the fire was discovered, several of the eight passengers were in the main cabin and the others were on the upper deck. After one of the deckhands expended a portable fire extinguisher into the engine room, he instructed the passengers in the main cabin to go to the foredeck. However, he did not inform them of the seriousness of the situation or provide them with lifejackets before they left the passenger cabin. When the passengers arrived at the foredeck, no crewmember was there to instruct them in emergency procedures or to manage their safety. The master, correctly, initially had to remain in or near the pilothouse to sound the ship's whistle to alert nearby vessels that the *Port Imperial Manhattan* was in distress because of the loss of electrical power and radio communications capability.

The passengers milled about on the foredeck and began to discuss among themselves what they should do to protect themselves from the fire. One passenger, at her own initiative, used her cellular telephone to contact the 9-1-1 emergency operator to report the fire and to call for assistance. Other passengers considered whether they were going to have to abandon ship.

Neither the master nor the deckhands could attend to the passengers during the early stages of the emergency because the crewmembers were trying to extinguish the fire or to alert others to their situation. The inability of the crew to manage the passengers caused some passengers to panic and take actions that potentially placed them in jeopardy. One passenger reentered the smoke-filled passenger cabin to retrieve lifejackets for him and the other passengers. This action placed him in a life-threatening situation in which he could have been overcome by the smoke before he could make it safely back to the foredeck. Another passenger, after hearing an explosion on board the vessel, had to be restrained from jumping into the river. Given the low visibility at night, the swiftness of the current, and the coldness of the water, a passenger jumping over the side without a lifejacket probably would have drowned before being located and rescued by emergency responders. Consequently, the Safety Board concludes that the crew of the *Port Imperial Manhattan* were unable to properly manage the passengers during the emergency because they were over tasked with fighting the fire and lacked adequate resources and training.

During a shipboard emergency, crewmembers need to be able to take appropriate action to deal with the emergency and to protect their own safety as well as the safety of passengers. However, in order for crewmembers to maintain control of the passengers during an emergency, they must be properly trained. Crowd management courses should include, at a minimum, training in the following areas to enable crewmembers to assist passengers during emergencies:

- Awareness of emergency plans and instructions and the knowledge of emergency exits and evacuation restrictions;
- Ability to assist passengers en route to muster and embarkation stations, including how to give clear reassuring orders, how to control passenger movement, how to keep escape routes clear of obstructions, how to evacuate disabled people and those needing special assistance, and how to search accommodation spaces; and
- Knowledge of effective mustering procedures, including the ability to use effective procedures for keeping order and for reducing and avoiding panic and the ability to ensure that the passengers have donned their lifejackets correctly.

The instruction and drills provided to the crew of the *Port Imperial Manhattan* did not prepare them for providing the necessary control of the passengers during the fire emergency. Fortunately, only eight passengers were on board at the time of the fire. However, the vessel was certificated to carry as many as 350 passengers at one time and if more passengers had been on board and if they had panicked or taken actions that placed them in jeopardy, the consequences could have been significantly more serious. The Safety Board, therefore, concludes that, without proper training, the masters and

deckhands on small passenger vessels in commuter and ferry service are ill-prepared to control large numbers of passengers during fires or other shipboard emergencies. Consequently, the Safety Board believes that the Coast Guard should require that owners and operators of small passenger vessels in commuter and ferry service provide crowd control training to their vessel operating crews. The Safety Board furthermore believes that, in the interim, before regulatory requirements become effective, the Coast Guard should revise NVIC No. 1-91 to provide detailed guidance for the small passenger vessel industry concerning proper crowd control management procedures for masters and deckhands to follow during a shipboard fire or other emergency.

Lifejacket Stowage

On the *Port Imperial Manhattan*, all of the passenger lifejackets were stowed in lockers at the aft end of the main cabin, next to the engine room door, rather than distributed throughout the vessel. A passenger and, later, the master entered the smoke-filled cabin, risking serious injury, to retrieve lifejackets for the passengers. Adult- and child-size lifejackets were not segregated in the lockers. Therefore, when the lifejackets were distributed, an adult passenger mistakenly received a child-size one.

Lifejackets are essential safety appliances that should be donned by the passengers in the earliest moments of a fire. Passengers may have to retrieve and don lifejackets without assistance because the crewmembers may be devoting all of their attention to the fire. Stowing lifejackets in one area on board a vessel makes them vulnerable to becoming inaccessible during an emergency. For example, if a fire occurs between the vessel's occupants and the stowage area, retrieving the lifejackets might be impossible. Using a single stowage area can also cause serious problems even when the area is not physically cut off. If a vessel were carrying a large number of passengers and they had to retrieve lifejackets from a central location, the crush of people all heading to the same location could incite panic and cause injury.

In addition, stowing child-size lifejackets with adult-size lifejackets increases the chances that passengers will receive the wrong size jacket during an emergency. Further, tightly wrapping and clipping the stowed lifejackets increases the risk of passengers not being able to don the lifejacket in time for the emergency.

The Safety Board concludes that if the lifejacket stowage had been more evenly distributed on the *Port Imperial Manhattan*, the lifejackets would have been more accessible to the passengers. The port engineer for NY Waterway stated that the *Port Imperial Manhattan* and *Port Imperial New Jersey* were the only vessels in the company's fleet that did not have lifejackets stowed beneath the seats. The *New Jersey* was modified during the January 2002 shipyard period so that its lifejackets were distributed throughout the vessel. Specifications for rebuilding the *Port Imperial Manhattan* included provisions for the proper distribution of lifejackets.

The problem with lifejacket stowage is not unique to the two NY Waterway vessels. In the *Argo Commodore* fire, the Safety Board found that the lifejackets were not readily accessible and some passengers had difficulty donning their lifejackets. The lifejackets stowage area was obstructed and some of the lifejackets were so tightly wrapped and clipped that some passengers had difficulty unfastening the clips and, as a result, improperly donned the jackets. Based on its findings, the Safety Board asked Commodore Dining Cruises, Inc., the owner of the *Argo Commodore*, to correct the problems, which the company did.

The Safety Board is concerned that other operators have small passenger vessels on which the stowage of lifejackets is not properly distributed and/or the lifejackets are not segregated by size. Federal regulations stipulate that that lifejackets on small passenger vessels shall be stowed so that adult- and child-size jackets are segregated from each other and that they are “in convenient places distributed throughout accommodation spaces.” Coast Guard inspectors must check the lifejackets and stowage areas during their periodic examinations. However, as a practice, the vessel operators generally remove the jackets from their stowage locations to facilitate the inspector’s review. As a result, inspectors can overlook problems related to the stowage of the lifejackets.

Vessel owners are responsible for the lives of the passengers on their vessels. In the case of NY Waterway and Commodore Dining Cruises, Inc., the companies voluntarily made changes to improve stowage and distribution of lifejackets. The Safety Board believes that the Coast Guard should issue a directive to small passenger vessel operators to review the distribution of lifejackets on board their vessels and to ensure that the lifejackets are accessible and segregated.

Safety Information Provided to Passengers

In this accident, the passengers on the *Port Imperial Manhattan* did not receive a verbal safety briefing before the onset of the voyage. Several passengers indicated that they didn’t realize the potential seriousness of the situation when they were asked to move to the outer deck. Once on the foredeck, they discussed whether they needed lifejackets and what actions they might have to take.

The Safety Board has long been a proponent of safety briefings on small passenger vessels, encouraging owners and/or operators to incorporate prevoyage verbal safety briefings to passengers into their operating procedures and asking the Coast Guard to make safety briefings mandatory. A verbal safety briefing serves multiple purposes. It informs the passengers about emergency procedures and refreshes the crewmembers’ understanding of those procedures. A safety briefing also gives passengers the opportunity to ask questions if they do not understand the procedures.

In its investigation of the 1994 *Argo Commodore* accident, the Safety Board found that the safety placard on the small passenger vessel did not fulfill its intended purpose. At that time, Federal regulations gave the owner the option of using either a safety placard or a safety briefing. Based on its findings in the *Argo Commodore* fire, the Safety Board issued the following safety recommendation to the Coast Guard:

M-95-41

Require that the operators of small passenger vessels conduct a passenger safety briefing prior to departure to include: the location of lifesaving equipment; the use of such equipment; and proper procedures to follow during the course of an emergency evacuation or other on-board emergency.

As a result of this recommendation, the Coast Guard revised CFR 185.506 to require that the masters of small passenger vessels ensure that suitable public announcements are made informing all passengers of, among other safety information, the location of lifejackets, emergency exits, survival craft embarkation areas, and instructional placards for lifejackets and other lifesaving devices. The regulations also require that the crewmembers advise all passengers that they may be required to don lifejackets when hazardous conditions exist and that passengers receive a demonstration either collectively or individually on how to don a lifejacket. The regulations, however, allow an exception to the requirement for a verbal safety brief. The regulation states, in part, "Ferries operating on short runs of less than 15 minutes may substitute bulkhead placards or signs for the announcement if the OCMI determines that the announcements are not practical due to the vessel's unique operation."

The Coast Guard had granted NY Waterway an exception from the verbal safety briefing to passengers at the onset of voyages because the trips of the company's vessels lasted less than 15 minutes. The exception did not eliminate the requirement for safety placards, and the *Port Imperial Manhattan* did have placards posted in the main cabin.

The Safety Board maintains that basic safety information needs to be announced to passengers on any vessel before the onset of waterborne operations, regardless of the length and duration of a voyage. An emergency can arise at any moment while the vessel is underway and, given the limited number of crewmembers per passenger, people need to be able to take basic initial actions for their own safety. Essential actions that adult passengers should be able to take include obtaining and donning lifejackets for themselves and their children and going to the proper assembly area.

Vessel operators should not rely on passive notification such as posted placards to provide essential safety information to passengers. Passengers may not read placards before an emergency. On the other hand, a short verbal safety announcement can focus the attention of passengers on the basic safety information that they need to know in order to respond correctly in an emergency. Given the ready availability of technology that allows for prerecorded safety briefings to be aired over intercoms and loudspeaker systems, commuter vessels and ferries can readily provide verbal safety briefs without crewmembers having to take time away from other vessel operation activities. The Safety

Board concludes that a mandatory safety briefing on emergency procedures on passenger vessels in commuter and ferry service would enhance passenger safety. The Safety Board, therefore, believes that the Coast Guard should eliminate the waiver for verbal safety briefings and require that such briefings be given to passengers on all small passenger vessels.

Vessel Communications

Shortly after the master saw smoke issuing from the engine vent, he made a VHF radiotelephone call to a nearby NY Waterway vessel and requested that the vessel standby. However, moments later, the *Port Imperial Manhattan*'s radio became inoperative when the fire burned through the cables to the pilothouse. The VHF radiotelephones on the *Port Imperial Manhattan* did not have an emergency power backup; none was required for the small passenger vessel because it measured less than 100 gross tons. Fortunately, a deckhand and a few passengers had personal cellular telephones and were able to contact company officials and the emergency 911 operator. A FDNY rescue boat and a NY Waterway ferry responded to the *Port Imperial Manhattan* and safely evacuated the passengers and crewmembers. According to the passengers, moments after the evacuation, the foredeck of the *Port Imperial Manhattan*, where they had been standing, was engulfed in flames.

After losing power to the VHF radiotelephone, the *Port Imperial Manhattan* could not communicate with emergency response vessels and other river traffic. If a passenger had jumped or fallen overboard into the water, the *Port Imperial Manhattan* would not have been able to inform other boats, including the rescue boat, which would have further endangered the person in the water. The *Port Imperial Manhattan* would not have been able to inform the rescue boat of injuries to passengers or crew to ensure the availability of appropriate transport and medical service. Without a working radio, the *Port Imperial Manhattan* would not have been able to confirm the number of people on board. In contrast, with radio backup, the *Port Imperial Manhattan*'s crew could have informed the rescue boats of the seriousness of the situation and could have helped coordinate the rescue operation, perhaps hastening the process. The Safety Board concludes that the loss of VHF radiotelephone communication unnecessarily increased the risk to passengers and crewmembers. Although the *Port Imperial Manhattan* was less than 100 gross tons and, therefore, not required to have an emergency source of power for its VHF radiotelephone, its operator, NY Waterway, has since taken corrective action so that all its vessels have a battery backup in the wheelhouse for the communications systems. The Safety Board is concerned, however, that other operators of commuter passenger vessels measuring less than 100 gross tons might not voluntarily take such a step. The Safety Board concludes that without a backup source of power to the VHF radiotelephone, the crewmembers and passengers on small commuter vessels will be placed at increased risk in the event of a loss of power. The Safety Board believes that the FCC should require that small passenger vessels have VHF radiotelephone communications systems on board that can operate even when the vessel loses power.

Conclusions

Findings

1. None of the following were factors in the *Port Imperial Manhattan* accident: weather, operator fatigue, drugs, or alcohol.
2. The fire on the *Port Imperial Manhattan* started in the junction box as a result of a loose connection and spread throughout the after portion of the engine room. The open access door then allowed the fire to spread to other areas of the vessel.
3. A routine Coast Guard inspection of the vessel probably would not have detected the loose connection that led to the fire on the *Port Imperial Manhattan*.
4. Had NY Waterway had an effective preventive maintenance program, the loose electrical connection could have been detected before it caused the fire on the *Port Imperial Manhattan*.
5. The lack of fire detection systems for engine rooms on existing small passenger vessels in commuter and ferry service presents an unacceptable risk to passengers and crewmembers.
6. The lack of remotely operated fire pumps on the *Port Imperial Manhattan* compromised the ability of the crew to control the fire and the lack of remotely operated fire pumps on other small passenger vessels in commuter and ferry service built before March 11, 1996, similarly impairs the ability of their crews to control engine room fires.
7. If the *Port Imperial Manhattan* had been equipped with a fixed fire suppression system, properly trained crewmembers could have extinguished the fire and kept it within the confines of the engine room.
8. The safety of existing small passenger vessels in commuter and ferry service would be enhanced by the installation of fire suppression systems in their engine rooms.
9. The crewmembers' firefighting efforts were ineffective in controlling or extinguishing the *Port Imperial Manhattan* fire because they lacked adequate firefighting training.
10. The lack of formal emergency training for crewmembers on small passenger vessels leave them unprepared to handle emergencies and, therefore, creates an unsafe environment for the traveling public.

11. The crew of the *Port Imperial Manhattan* were unable to properly manage the passengers during the emergency because they were over tasked with fighting the fire and lacked adequate resources and training.
12. Without proper training, the masters and deckhands on small passenger vessels in commuter and ferry service are ill-prepared to control large numbers of passengers during fires or other shipboard emergencies.
13. If the lifejacket stowage had been more evenly distributed throughout the passenger cabin of the *Port Imperial Manhattan*, the lifejackets would have been more accessible to the passengers.
14. A mandatory safety briefing on emergency procedures on passenger vessels in commuter and ferry service would enhance passenger safety.
15. The loss of VHF radiotelephone communication unnecessarily increased the risk to passengers and crewmembers.
16. Without a backup source of power to the VHF radiotelephone, the crewmembers and passengers on small commuter vessels are placed at increased risk in the event of a loss of power.

Probable Cause

The National Transportation Safety Board determines that the probable cause of the fire aboard the *Port Imperial Manhattan* was NY Waterway's inadequate inspection and maintenance of the vessel's electrical system. Contributing to the extent of the damage were the lack of a fixed fire detection and suppression system and the crewmembers' lack of knowledge of proper marine firefighting techniques.

Recommendations

As a result of its investigation of this accident, the National Transportation Safety Board makes the following recommendations:

To the Coast Guard:

Require that companies operating domestic passenger vessels develop and implement a preventive maintenance program for all systems affecting the safe operation of their vessels, including the hull and mechanical and electrical systems. (M-02-5)

Require that all small passenger vessels in commuter and ferry service, regardless of their date of build, be fitted with a fire detection system in the engine rooms. (M-02-6)

Require that all small passenger vessels in commuter and ferry service, regardless of their date of build, be fitted with remotely operated fire pumps. (M-02-7)

Require that all small passenger vessels in commuter and ferry service, regardless of their date of build, be fitted with a fixed fire suppression system in their engine rooms. (M-02-8)

Establish firefighting training requirements for crewmembers on board small passenger vessels in commuter and ferry service. (M-02-9)

Revise Navigation and Vessel Inspection Circular No. 1-91 so that it provides more in-depth guidance in training and drills for firefighting on board small passenger vessels. (M-02-10)

Require that owners and operators of small passenger vessels in commuter and ferry service provide crowd control training to their vessel operating crews. (M-02-11)

Revise Navigation and Vessel Inspection Circular No. 1-91 to provide detailed guidance for the small passenger vessel industry concerning proper crowd control management procedures for masters and deckhands to follow during a shipboard fire or other emergency. (M-02-12)

Issue a directive to small passenger vessel operators to review the distribution of lifejackets on board their vessels and to ensure that the lifejackets are accessible and segregated. (M-02-13)

Eliminate the waiver for verbal safety briefings and require that such briefings be given to passengers on all small passenger vessels. (M-02-14)

To NY Waterway:

For the vessels in your fleet, develop and implement a preventive maintenance program for systems affecting safe operation, including the hull and the mechanical and electrical systems. (M-02-15)

To the Passenger Vessel Association:

Provide your members with guidelines for developing a preventive maintenance program for all systems affecting the safe operation of their vessels, including the hull and the mechanical and electrical systems. (M-02-16)

To the Federal Communications Commission:

Require that small passenger vessels have VHF radiotelephone communications systems on board that can operate even when the vessel loses power. (M-02-17)

BY THE NATIONAL TRANSPORTATION SAFETY BOARD

MARION C. BLAKEY
Chairman

JOHN A. HAMMERSCHMIDT
Member

CAROL J. CARMODY
Vice Chairman

JOHN J. GOGLIA
Member

GEORGE W. BLACK, JR.
Member

Adopted: June 11, 2002

Appendix A

Investigation

The Safety Board was notified of this accident at 2135 on November 17, 2000, by the New York City Office of Emergency Management and dispatched an investigator to the scene. During the on-scene investigation, which concluded on November 22, 2000, the vessel was examined and the vessel's crew, company officials, passengers, and cognizant U.S. Coast Guard officials were interviewed. The U.S. Coast Guard and New York Waterway were named as parties to the investigation.

Appendix B

Navigation and Vessel Inspection Circular No. 1-91

U.S. Department
of Transportation

**United States
Coast Guard**



Department of Transportation
United States Coast Guard

COMDTPUB B 16700.4 NVIC 1-91 20 Feb 1991

NAVIGATION AND VESSEL INSPECTION CIRCULAR NO. 1-91

Subj: Recommended Qualifications for Small Passenger Vessel Deckhands

Ref: (a) 46 CFR Part 15

(b) Marine Safety Manual Volume III Chapter 19

1. PURPOSE. The purpose of this circular is to provide the Marine Industry with guidelines for the recommended qualifications and training topics for deckhands engaged or employed on small passenger vessels to ensure the safe operation of these vessels. This circular also discusses the concept of SENIOR DECKHAND.

2. BACKGROUND.

a. Various statutes in Title 46 United States Code, the implementing regulations in Title 46 Code of Federal Regulations part 15, and the Marine Safety Manual, volume III, chapter 19, provide the requirements for vessel manning. In recent years there has been an increase in the number of innovative vessel designs tailored to take advantage of the admeasurement exemptions that have resulted in Small Passenger Vessels with significantly increased passenger capacity over what was envisioned when the current manning and deckhand qualification scheme was developed. In some cases, vessels over 200 feet long, carrying in excess of 1,000 passengers and on international routes have been admeasured at less than 100 gross tons. This increase in vessel capacity has raised concerns on the part of the Coast Guard, industry and others regarding the level of training and qualifications of the deckhands employed on all Small Passenger Vessels.

b. The Coast Guard and the industry recognize that a Small Passenger Vessel's licensed officer(s) would be unable to navigate the vessel and effectively respond to emergencies such as fire, engineering casualties, collision, flooding, medical emergencies, man overboard, etc. without the assistance of trained and qualified deckhands.

c. The Coast Guard, in consultation with the industry, has determined that the best approach to improving deckhand training and qualifications is to allow the industry to undertake a voluntary training program which will provide an increased level of knowledge and skill for their crew members. The Coast Guard believes that because of the generally high level of responsibility and concern displayed by the industry that this approach will be both successful and cost effective.

3. DISCUSSION.

a. The employment and training of qualified deckhands is the responsibility of the marine employer (46 CFR 15.103). The Coast Guard is issuing, by means of this NVIC, recommended criteria for assessing the qualifications of an individual deckhand.

b. The Marine employer is responsible for ensuring that an individual engaged as a deckhand on a small passenger vessel:

- (1) Meets the minimum physical requirements;
- (2) Is familiar with the location of equipment and procedures; and
- (3) Has demonstrated the ability to respond to emergency situations.

c. This NVIC is not intended to be all encompassing nor indicative of the topics of training for every deckhand, but rather it is a general guide that should be adapted to individual vessel operations.

d. At the discretion of the Officer in Charge, Marine Inspection, some or all of the deckhands may be permitted to perform duties such as concessionaires, waiters or waitresses provided that they can readily respond to their regularly assigned deckhand duties. However, cooks and foodhandlers should not normally be accepted as deckhands, because of their employment status and good health practices.

e. The Coast Guard is responsible for determining that Small Passenger Vessels are manned with competent crews. The method of accomplishing this is left to the discretion of the Officer in Charge of Marine Inspection (OCMI). In general, this is accomplished by relying on the vessel inspection process including the proper performance of emergency drills and the questioning of the crew on duties assigned and/or a review of the company training program. There is no intent that company training programs undergo any formal Coast Guard approval process.

4. ACTION.

a. The guidelines contained in this circular apply to Small Passenger Vessels and are intended for use by Small Passenger Vessel owner/operators and masters of vessels less than 100 gross tons. Enclosure (1) provides guidance for marine employers and masters of Small Passenger Vessels to use when structuring training programs for deckhands.

b. OCMI'S should use this circular as guidance during inspections for certification and reinspections, when evaluating training programs, and during drills conducted to ensure crew competency.

c. The criteria proposed should be tailored to specific vessel needs on the basis of:

- (1) Operating conditions of the vessel on which the deckhand is employed;
- (2) Overall vessel complexity;
- (3) Number of passengers carried; and
- (4) The specific duties the deckhand is expected to perform.



J. P. Sipes
Rear Admiral, U.S. Coast Guard
Chief, Office of Marine Safety, Security
and Environmental Protection

End: (1) Recommended Qualifications for Deckhands on Small Passenger Vessels

RECOMMENDED QUALIFICATIONS FOR DECKHANDS ON SMALL PASSENGER VESSELS

I. Every deckhand on a small passenger vessel should be at least 16 years of age, should be qualified as to sight, hearing, and physical condition to perform the deckhand's duties and should be physically able to perform all duties associated with the protection and evacuation of passengers during emergency situations.

II. Every deckhand should be familiar with the following matters relating to emergency conditions:

A. Man Overboard.

1. Location and use of lifesaving equipment.
2. The vessel's maneuvering characteristics.
3. Emergency communications skills.
4. Proper recovery procedures.
5. Station bill assignment/duties.

B. Fire.

1. Fire detection and alarm systems.
 2. Classes of fires and the appropriate fire fighting technique.
 3. Location and operation of fire fighting equipment.
 4. Location and operation of power, ventilation and fuel shut-offs.
 5. Location and operation of watertight doors, hatches, fire-screen doors and escapes.
 6. Mustering passengers.
 7. Station bill assignment/duties.
- C. Abandon Ship.
1. Location, launching, and operation of survival equipment and craft (this includes, but is not limited to lifeboats, liferafts, buoyant apparatus, lifefloats, survival suits, and personal flotation devices).
 2. Proper method of abandoning the vessel, mustering and debarking passengers.
 3. Proper emergency communications procedures (i.e., EPIRB, distress signals).
 4. Station bill assignment/duties.
- D. Foul Weather.
1. Location and operation of watertight and weathertight closures.
 2. Means of access to weather information.
 3. Location and operation of bilge and emergency pumping systems.
 4. Station bill assignment/duties.
- E. Medical Emergency.
1. Red Cross certified in first aid and CPR. (Minimum of 50 percent of required deckhands)
- F. Collision.
1. Location of watertight doors.
 2. Methods of dewatering.
 3. Station bill assignment/duties.

III. Deckhands assigned to seamanship duties, engineering or passenger safety/control duties should be familiar with the appropriate vessel operational matters based on their assigned positions:

A. Bridge.

1. All navigational equipment, engine alarms/indicators, controls, gauges, and communication procedures.

B. Engineering.

1. Main and auxiliary machinery, steering systems, alarms, refueling techniques, and emergency procedures (i.e., fuel, electrical, ventilation, etc.).

2. In instances where a larger vessel with complex engineering systems or other factors has been required by the OCMI to have unlicensed engineers in the required complement, these individuals will require a greater in-depth knowledge of and training in the subjects noted above. The OCMI may require specific training and qualification requirements for these individuals.

C. Safety.

1. Crowd control, rigging, line handling, casualty control, first aid and CPR.

D. Vessel Assistance.

1. Search and rescue techniques, towing, and superior shiphandling skills.

E. Seamanship.

1. Knots, linehandling, docking/undocking procedures, and basic navigation (i.e., piloting, deadreckoning).

IV. Senior Deckhand.

A. In many situations it is important for the vessel's master to have available a more highly qualified deckhand, for example where the Officer in Charge, Marine Inspection has allowed the deletion of the required mate. In addition to having a more in-depth knowledge of the above subjects, the SENIOR DECKHAND should also have practical experience on the vessel on which he or she is serving. The recommended experience for the SENIOR DECKHAND is:

1. 30 days experience on board the vessel.

2. 30 hours at the helm under supervision of a master or mate.

B. The SENIOR DECKHAND will provide an increased level of experience on vessels where there is only one licensed officer required. The SENIOR DECKHAND will

be responsible for supervising the other deckhands while the vessel is underway and act as the team leader in response to any emergencies on board. He or she will be able to assist the master in the operation of the vessel, and will be available to operate the vessel in the event the master becomes incapacitated. In order to properly identify this individual, the vessel's master should designate the SENIORDECKHAND in writing and a copy of this designation should be retained on board the vessel.

Appendix C

History of Regulations for Small Passenger Vessels

The term “small passenger vessel” generally includes any vessel of less than 100 gross tons that is certified to carry more than six passengers for hire. The first Federal requirements governing these vessels became effective June 1, 1958, as Subchapter T (46 CFR Parts 175-187). As these regulations became outdated, the Coast Guard initiated a project to revise Subchapter T in 1982 and established a regulatory docket in 1985. On January 30, 1989, the Coast Guard issued a notice of proposed rulemaking (NPRM), titled “Small Passenger Vessel Inspection and Certification,” proposing a complete revision to the regulations. Based on the numerous comments received in response to this NPRM, including those from the Safety Board, the Coast Guard revised the NPRM extensively and published the new proposed regulations in its supplemental notice of proposed rulemaking (SNPRM) on January 13, 1994. The Coast Guard again received numerous comments, based on which the Coast Guard published an Interim Final Rule (IFR) on January 10, 1996, which became effective on March 11, 1996. The Coast Guard stated that an IFR was necessary for publishing an enforceable rule, while allowing public comment.

In the Federal Register issue of September 30, 1997, the Coast Guard announced that it was adopting the IFR (with minor changes) as a Final Rule, effective October 30, 1997. The new rules were intended to address changes that had occurred in the passenger vessel industry since the early 1960s, such as increases in vessel size and passenger capacity, increases in services, expansions of vessel routes, and technological advances.